ELECTRICAL REVIEW

AN ILLUSTRATED WEEKLY JOURNAL OF SCIENTIFIC AND ELECTRICAL PROGRESS.

VOL. 32. No. 6. WEEKLY. NEW YORK, WEDNESDAY, FEBRUARY 9, 1898. $3 PER ANNUM. SINGLE COPIES, 10 CENTS.

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VIEWS, NEWS AND INTERVIEWS.

A five-inch rapid-fire rifled gun undergoing a test at the Sandy Hook proving grounds burst on January 31. Seventy-three shots had been fired, when at the seventy-fourth discharge the gun was shattered into fragments. Two pieces, each weighing over 200 pounds, flew over the protecting rear sand butts into the office of the Commercial Cable Company, where William H. Murray and John Nannery, two operators, were on duty. Murray was struck on the left leg, which was broken above the ankle. An army surgeon prepared Murray for transportation to the New York Hospital for treatment.

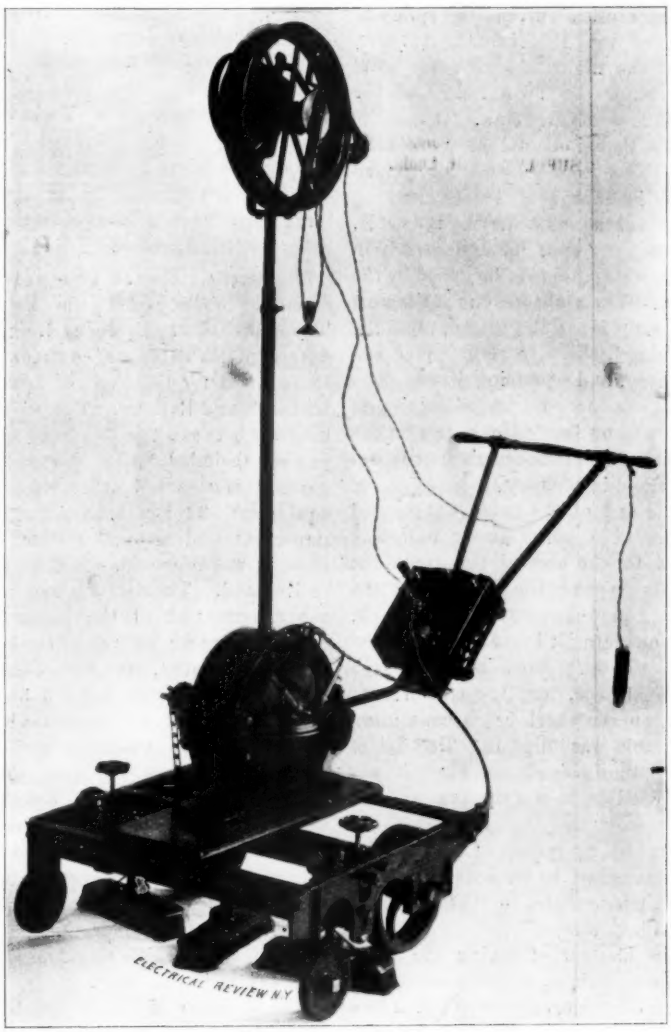
Cars on the Akron, Bedford & Cleveland Railroad, the long suburban trolley line running out of Cleveland, Ohio, now carry tin flags announcing the weather bureau predictions. The rural residents along the road are greatly pleased with the innovation.

A man who distinguished himself as a football player in a noted preparatory school and tried unsuccessfully to enter Princeton last Fall is now a gripman on a trolley car in a town in Pennsylvania, according to a daily paper. He could play football, but he did not have the money with which to pay his tuition fees at Old Nassau. It is said that he counted on the financial support of several rich students, who, having seen him play in school, believed that he would be a remarkable acquisition to the Tiger eleven. Failing to get into Princeton the young man did not care to go back to school, and received a chance to make long and short runs on the trolley.

It is rumored that the consolidation of all the trolley roads of New Jersey, under the name of the Union Traction Company, will take place shortly. Various sums ranging between $50,000,000 and $100,000,000 have been mentioned as the capitalization of the combination. The last step taken was the cessation of hostilities between the New York & Philadelphia and the Brunswick Traction companies last week. These two companies have been at loggerheads for some time over securing a right of way through the town of Bound Brook. Another gap in through lines recently filled was at Millburn, through which the North Jersey Company has at last secured a right of way. Franchises are now held by the various companies for through lines between New York, Greenwood Lake, Easton and Philadelphia.

Mr. George A. Damon, of Chicago, recently made a very complete efficiency test of the Englewood & Chicago Electric Railway. This road is equipped with storage batteries, and the test was made for the purpose of finding out where improvements could be adopted, and was not intended as an exhibition test made under the best possible conditions. The results obtained were highly satisfactory.

Mr. Frank W. Hawley is quoted as saying that he will recommend to the Cataract General Electric Company that it offer a prize of $25,000 for the best plan of towing canal boats by electricity.



AN ELECTRIC FLOOR-SCRUBBING MACHINE.

An Electric Floor-Scrubbing Machine.

In the accompanying illustration is shown a very unique labor-saving device, invented and patented by Mr. H. F. Ackerman, of Cleveland, Ohio. It is an electric floor-scrubbing machine, which is claimed to do the work of scrubbing floors thoroughly in one-quarter the time, or at a saving of 75 per cent over the old method of hand scrubbing. The machine is designed for use in government, state, and large office buildings, hotels, hospitals, department stores, armories, and, in fact, any place where there are large expanses of floor space. The inventor states that the machine has been in actual service, among other places, for two years in the Hickox Building, Cleveland, doing the work of scrubbing on eight floors in two and one-half hours, as against 10½ hours hand labor formerly required. This, it is said, has resulted in a saving of $75 each month in this one building alone.

As will be observed from the illustration, the machine is operated by an electric motor, which receives its current through the lamp cord shown, which may be attached to any convenient incandescent lamp socket. The reel at the top of the trolley pole has a spring tension and takes up the slack cord. The frame carries three scrubbing-brushes, which are held against the floor by means of spring pressure, and are geared with the motor so as to revolve at about 400 revolutions per minute. The wheels on which the machine rolls are rubber tired, and the whole apparatus can be very easily pushed along the floor somewhat like a lawn mower. It is found that the action of the brushes in rotating tends to draw the machine along, so that the operator has really little more to do than to guide it. Water is thrown on the floor and the scrubbing machine guided over it by the operator, and the work is done.

When in use, the front and sides of the machine are protected by zinc splash-boards. A rheostat is located on the handle of the machine, and the motor is fully protected by fuses. The apparatus weighs about 300

pounds, and its frame is about 30 inches square. The brushes are so set that they will run practically to the baseboard of the wall.

The gearing between the motor and scrubbing-brushes is accomplished by means of a sprocket chain leading from the motor to the axle on which the larger wheels ordinarily loosely revolve, and from that axle by a second sprocket chain to a shaft connected by bevel gears with vertical shafts operating the brushes. This allows the machine to be easily converted into a hand machine if so desired. In place of the scrubbing-brushes, sandpaper blocks or blocks of stone may be used, and thus the machine may be utilized to dress down wood floors, the decks of vessels, or mosaic tiling.

THE TELEPHONE "LANG SYNE."*

BY JOEL C. CLARK.

1. Should old experience be forgot
And rarely brought to mind?
When contracts by the score we made,
But were not freely signed.

CHO.—Oh! keep in thought old '78,
Remember '79;
And raise a song for '80, boys,
Our Telephone Lang Syne.

2. When lines and purposes were crossed,
And customers *would* whine,
We chafed a bit in office, boys,
Yet did not once resign.

CHO.—No! Not in '78, my boys,
Nor yet in '79;
We held the fort in '80, boys,
That Telephone Lang Syne.

3. Now, after twenty years, my boys,
We've got the thing down fine;
Nor do we drop the licenses
We took 'round '79.

CHO.—Then harp on '78, my boys,
Hurrah for '79;
And sing of 18-80 boys,
The Telephone Lang Syne.

4. Here let us think of absent ones,
Now past life's "busy line,"
While we with wreaths of gratitude
Their memories entwine.

CHO.—For we were friends in '78,
And chums in '79,
And brethren all in '80, boys,
That Telephone Lang Syne.

5. Still give them place around our board—
Those friends of yours and mine—
And keep in mind their record, boys,
When we come here to dine.

CHO.—So gladly toast old '78,
And talk of '79,
And sing of 18-80, boys,
The Telephone Lang Syne.

LITERARY.

The *Scientific American Supplement* catalogue has been issued in a cloth binding and forms a valuable guide for obtaining information on a multitude and wide range of subjects. It is published by Munn & Company, 361 Broadway, New York.

* Sung at the dinner given by the Southern New England Telephone Company at the New Haven House, January 28, 1898, in commemoration of the opening of the first telephone exchange in the world, at New Haven, Ct., January 28, 1878.

Completing the Postal Company's Marine Cable System.

On Saturday, January 29, a cable was laid from Sandy Hook to the mainland, thereby completing the system which the Postal Telegraph-Cable Company have been establishing for a most complete marine service.

On Friday, the day previous, a party of gentlemen, including Capt. W. L. Candee and Mr. George T. Manson, of the Okonite Company; Mr. E. G. Cochrane, general superintendent of construction for the eastern division of the Postal company; Mr. Geo. W. Blanchard, assistant superintendent, and a representative of the ELECTRICAL REVIEW, spent the night at a Summer hotel just below the Twin Lights of the Highlands of Navesink. It was the plan of Captain Scott, the "wrecker" from New London, with his trained crew, in charge of a sea-going tug and wrecking scow carrying the cable, to reach the spot for laying early in the morning, there to be joined by the party. The night was one of the most tempestuous of the season, and the morning broke with skies leaden and lowering, and a piercing wind. The party was carried by a locomotive to the point of Sandy Hook, and on the arrival of Captain Scott's flotilla was embarked in lifeboats.

The end of the cable was carried ashore at a point about half way down to the end of the Hook, or shortly beyond the spot where the ocean has broken across Sandy Hook, thus changing it into an island. Connections were then made at the terminal pole, and the trench running up the short beach containing the cable was filled in. Because of the shallowness of the water it was not possible to use the tug, and the huge scow carrying the cable was compelled, by means of its own engine attached to anchors carried to the opposite shore, to "lift itself up by its boot straps."

The method of laying the cable was most unique, as instead of having it run off from reels it was coiled in a circle on the deck, the end being paid out by passing through a block raised high in the air, then descending to the stern, passing through a brake, which was of wood so as not to injure the strands. As the scow moved slowly forward by means of its own engine connected to the anchor on the shore, the cable dropped evenly to the bottom.

When the strip of land which juts into the Horseshoe, with water on either side, was reached a bight of the cable was taken ashore, and by using a strong rope connected to the engine was hauled across the land to be taken up again on the other side by the scow and carried through the remaining water.

The length of the cable laid was about one mile in a straight line, and was one of the standard marine forms of which so many have been laid during the past years, made by the Okonite Company, of New York. The total weight was about 10 tons, or four pounds to the foot. This link gives the Postal Telegraph company a direct cable connection of its own from Coney Island across to Sandy Hook and from Sandy Hook to the Highlands. Also the alternative connection from Fire Island across Brooklyn to New York, and from Coney Island through New York Bay to New York city.

American Electric Locomotives for London.

The General Electric Company has received orders from the British Thomson-Houston Company, Limited, covering the complete contract for locomotives for the Central London Underground Railway. The original contract between the two latter companies included, with the special gearless motors and other electrical equipment, 32 locomotives for this important underground system, but these, it was supposed, would be built in England. The decision to confide the construction of the locomotive cabs and trucks, as well as the electrical equipment, to the General Electric Company is dictated by the desire to have the locomotives built complete under the same supervision.

The locomotives will each weigh about 45 tons, and will be equipped with a total of 800 horse-power in motors. The trains to be hauled will be made up of five cars, giving a total load of 150 tons, 10 tons heavier than the ordinary Manhattan elevated train. The schedule speed will be 15 miles an hour.

The diameter of the tunnel being 11 feet 6 inches only, motor cars could not be used. The entire electrical equipment will therefore be placed on locomotives which will probably resemble in appearance those in use on the Manufacturers' Railroad in New Haven, Ct., and on the Hoboken Shore Road, Hoboken, N. J.

The General Electric Company is building 36 additional 175-horse-power motors for the Metropolitan West Side Electric Elevated Road.

An Electric Supply Dealers' Association.

A meeting of electrical supply dealers and manufacturers was held in the Astor House, New York city, on February 1. About 40 gentlemen, well representative of the electrical supply business of New York, Philadelphia and Boston, were present and also a number of manufacturers. The essential object in the endeavor to form an association is to put this branch of the electrical industry on a better footing and to effect better prices for standard supplies. Such an association is said to be working successfully at Chicago and other points.

National Carbon Company.

The National Carbon Company, of Cleveland, Ohio, held their annual meeting on January 26 and re-elected the officers of last year for the coming year. The officers are: President, W. H. Lawrence; treasurer, Webb C. Hayes; secretary, H. E. Hackenberg. The board of trustees, in addition to the officials already mentioned, consists of Myron T. Herrick, James Parmalee, B. F. Miles, J. S. Bartlett and C. H. Newhall.

Electric Carriages in New York.

The Electric Vehicle Company, of New York city, is building 100 new carriages for its use in the city service. These carriages embody all the improvements which the past year's operation of the company's present carriages has suggested.

The electric carriage is undoubtedly solidly entered into the business life of the metropolis, and is rapidly becoming a popular method of conveyance.

COMMENT ON THE "ELECTRICAL REVIEW."

AN INTERESTING LETTER.

[*From the Chicago Tribune.*]

The ELECTRICAL REVIEW for January 5 celebrates the paper's change of size and form with an interesting illustrated letter by Nikola Tesla on his latest advances in vacuum tube lighting.

St. Lawrence Power Company.

The St. Lawrence Power Company, of Massena, N. Y., has certified to the Secretary of State that the whole amount of its capital stock of $6,000,000 has been paid in. The certificate is signed for the company by William C. Bane, president, S. M. Gardner Stewart and C. H. Reese.

PERSONAL.

Hon. J. D. Vandeman has been appointed receiver for the Electric Street Railway Company, of Delaware, Ohio.

The United States Senate, on February 1, confirmed the nomination of Charles H. Duell, of Syracuse, N. Y., to be Commissioner of Patents.

Mr. Max Osterberg, of New York city, has been appointed constructing engineer for the electrical exhibition, which will be held in Madison Square Garden, New York city, next May.

Mr. Charles H. Kirkland, who has been identified with his brother, Mr. H. B. Kirkland, for some months, has accepted a connection with the selling department of the C & C Electric Company, of New York.

Mr. H. C. Thomson, of the Electric Gas Lighting Company, of Boston, was elected manager of the company at the annual meeting. Mr. Thomson's friends will all extend congratulations over this deserved advancement.

The Connecticut Electric Lighting Association, at its annual meeting on January 31, elected the following officers for the ensuing year: President, James English, New Haven; treasurer, A. M. Young, Waterbury; secretary, Addison F. Hunie, New Haven.

Mr. C. E. Stump has assumed the presidency of the City Government Publishing Company, proprietors of the monthly magazine *City Government*. Mr. Stump has severed his connection with electrical journalism, in which field he has had many years' experience. The ELECTRICAL REVIEW wishes him well in his new position.

Dr. Louis Duncan, of Baltimore, Md., has been appointed to the important post of consulting engineer for the Third Avenue Railroad Company, of New York city. The company intends to adopt electric traction on all of its existing lines and others to be built. It is said that the improvements contemplated will cost about $6,000,000.

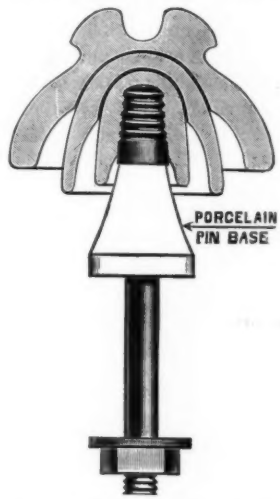
The bonds for the extension of the Hannibal Traction Company, of Hannibal, Mo., will soon be issued and the road improved, to handle the traffic now offered. New attractions in the way of parks will be established and a line built to the famous Hannibal Cave in the suburbs. G. W. Chance, 14 South Broad street, Philadelphia, and D. Thompson, of Hannibal, Mo., are interested.

Illinois Society of Engineers and Surveyors.

At the thirteenth annual meeting of this society, held at Peoria, Ill., on January 26, the following officers were elected: President, A. D. Thompson, Peoria; vice-president, W. A. Darling, Rock Island; executive secretary and treasurer, Jacob A. Harman, Peoria; recording secretary, J. C. Quade, Kewanee; trustees, W. D. Pence, Champaign; S. S. Greeley, Chicago; C. C. Brown, Bloomington. Champaign, Ill., was selected as the next meeting place.

A New High-Potential Insulator.

Mr. Fred M. Locke, of Victor, N. Y., the well known manufacturer of



LOCKE'S NEW HIGH-POTENTIAL INSULATOR.

insulators, has just placed upon the market the new porcelain insulator for high-voltage lines, shown in the accompanying illustration. It is a "three-part" china insulator, made of three shells fused together with glaze. The pin to which the insulator is attached is made of steel with a porcelain base.

Telegraph Contracts in Mexico.

The railroads of Mexico have filed a strong protest with the Mexican Government against the contract recently entered into between the Western Union and the Federal Telegraph Company and the Federal Government giving the Western Union exclusive control of the international commercial telegraph business of that country. The railroads say that this contract is a violation of their respective concessions. The Western Union service in Mexico was to have begun on January 5, but is postponed pending a decision from the government.

TELEPHONE NEWS AND COMMENT.

Hudson River Telephone Company declared a quarterly dividend of one per cent, payable February 1.

The New England Telephone and Telegraph Company has declared a dividend of $1.50 per share, payable February 15.

The annual stockholders' meeting of the New York & New Jersey Telephone Company will be held on March 4, in New York city.

The assets of the Best Telephone Manufacturing Company, of Baltimore, Md., are advertised to be sold on February 17 under foreclosure. The receivers for the company are J. S. Rosenthal and James Russell.

The instrument statement of the American Bell Telephone Company for the month ended January 20 is as follows:

	1898	1897	1896
Gross output	25,861	14,437	17,620
Returned	10,041	6,401	7,568
Net output	15,820	8,036	10,052
Total outstanding	938,073	781,885	686,588

Erie Telegraph and Telephone's regular quarterly dividend of one per cent will be payable on February 14. A net gain of 3,198 subscribers was made during the past year, and 1,367 grounded circuits were changed to metallic.

At the election of officers of the Newark, Ohio, Telephone Company, the following were chosen for the ensuing year: President, Edward Kibler; vice-president, George B. Sprague: secretary, W. S. Weiant; treasurer, Benj. Franklin.

At the annual meeting of the Northfield, Mass., Telephone Company, E. S. Bardwell was elected secretary and treasurer, and E. S. Bardwell and F. E. Stimpson, of Northfield; Messrs. Page and Holland, of Amherst, and Wesley Duncan, of Vernon, directors.

At the annual meeting of the Franklin, Me., Telephone and Telegraph Company the following officers were elected: President, Chester Greenwood; clerk and treasurer, F. E. Voter; directors, J. H. Thompson, Chester Greenwood and Frank W. Butler, of Farmington; H. S. Wing, of Kingfield; H. B. Luce, of Industry.

John B. Mallers, of Chicago, Ill., owner of the Mallers Building in La Salle street, near Jackson boulevard, has begun a suit in the Superior Court for $10,000 against the Chicago Telephone Company. The object of the suit is to test the right of the telephone company to string its wires on the tops of buildings without compensating the owners.

The House of Representatives on February 2 adopted an amendment to the District of Columbia appropriation bill, fixing the price of telephones at $50 per year when on a single wire, and with proportionately decreased rentals where one or more telephones are used on the same wire. The amendment was proposed by Representative Pitney, of New Jersey.

NEWS OF THE TRADE.

The New England Engineering Company, of Waterbury, Ct., has taken the agency for the state of Connecticut for the "D & W" fuse.

Mr. Dan Hemingway, of the Hemingway Glass Company, Cincinnati, Ohio, reports business as very good at present, and that the outlook for the coming year is very favorable in his line, if affairs continue as they are now.

Houston, Stanwood & Gamble, of Cincinnati, Ohio, have lately been engaged in filling some large orders calling for their cross-compound engines. They are now building two compound engines of 375 horse-power, each taking a wheel of 38-inch face and weighing 1,800 pounds, for the Sterns & Foster Manufacturing Company, of Lockland, Ohio. An order from South Whitney for a pair of 100-horse-power cross compounds, to be used as driving power for lighting the town with electricity, has just been completed by them. They are also making a pair of 325-horse-power engines with two driving wheels, weighing 2,000 pounds, for a cotton plant in Paducah, Ky.

Michigan City Railway in a Receiver's Hands.

A press dispatch from La Porte, Ind., under date of February 3, states that a receiver has been appointed for the Michigan City Street Railway. The liabilities are estimated at $40,000, and no statement of the assets has been made. The road is said to be owned by Mr. Russell B. Harrison.

A semi-annual dividend of $3.50 per share has been declared on the preferred stock of the United Electric Securities Company, payable May 2.

Abstract of President H. C. Higgin's Address to the Northwestern Electrical Association.*

I am a believer in associations and frequent conventions, and the more frequent the better. The oftener we meet and compare ideas and exchange grievances the better. I want to see the convention grow so large that it will be something after the three-ring circus style of entertainment, so that while one is addressing the association another will be giving experiments with meters or transformers or magnetic blow-outs, etc., there will be another man doing exercises on the blackboard, and still another a little farther on having his spurs strapped to his feet, insulated pliers in one hand and a coil of wire in the other, giving exhibitions of climbing a pole and doing various kinds of line work, while still another a little farther on will be giving exhibitions of armature-winding or taking niggers out of a commutator, or some other expert thing peculiar to the business.

I trust that each of you has come to this convention to talk as well as to listen, and thus give us all the benefit of your experiences in the business I am glad to be able to state that but one death has occurred in our ranks during the past year, and no company which is represented in this association has gone into the hands of a receiver within the past year except one and that was only temporarily. There has been no state legislation enacted that I consider particularly offensive to our business.

When we first went into the electric light business we paid $25 a thousand for carbons; we paid $1 each for incandescent lamps; 70 cents each for sockets, and all other supplies necessary for the business at corresponding high prices. The electric wattmeter has been an excellent thing for us, and I hope the time is near at hand when electric current will be sold only by meter.

One dangerous element that we have to look out for is the political schemer who is always working "for the dear people," and the gas and electric light companies are destined subjects of his attack. All our legislative halls from Congress down to our own little municipalities have quite a sufficiency of this element. He is constantly working in some scheme that will defeat the local lighting companies.

The street railway business has, I think, suffered more within the past two years than any other legitimate business. Not only have the hard times worked against them, but the bicycles have taken a large percentage of their business. The new woman, and many of the old ones, have hied themselves away from us on their wheels, and both have had plenty of followers. They have quit us cold, but it is to be hoped that they will soon return to us in a changed temperament, for, as repair bills for broken bicycles are met with and the many various disappointments which surround wheeling have become unbearable to them, such as punctured tires, breakdowns far away from home, etc., have worn out their patience, they will return to us and give up their nickels to the electric car even more willingly than they have ever done before.

It is gratifying, however, to street car men to know that the expenses of operating as well as those of original purchase have been very much reduced. The reduced receipts have had much to do with the reduction in operating expenses, so that perhaps after all the reduced receipts have been a blessing in disguise, although the reduced receipts have certainly not been the whole cause of our reducing expenses, for when we first went into electric street railway business it was all an experiment from start to finish.

And now in my closing remarks, while congratulating ourselves upon the pleasant side of the business, I would ask how long the restless brain or the genius of the nineteenth century, or even the twentieth century coming and already on our threshold, will let us alone. How long will it be before they will have some thing better to offer us for transporting passengers than an electric street railway? We are already threatened with the airship and the horseless carriage. What will be accomplished in this line is mere guesswork.

*Delivered at the sixth annual convention at Milwaukee, January 19, 1898.

The White Oaks & Kansas Railway has been incorporated by J. A. Eddy, W. A. Hawkins, H. A. Conner, G. L. Christie and W. S. Houston. The directors are C. D. Simpson, Scranton, Pa.; B. C. W. Harmon and G. W. Lowry, New York; John A. Eddy, Denver; C. B. Eddy, W. A. Hawkins, Max Frost, New Mexico. The capital stock is $4,000,000. The road runs from near White Oaks, Lincoln County, New Mexico, to points on the New Mexico–Texas line in Union County, about 250 miles north, and connecting a north road of the same name to be chartered under the laws of the state of Texas. Surveyors will be put to work in the field immediately.

ELECTRIC RAILWAY NOTES.

The annual statement of the Lehigh Traction Company, of Hazelton, Pa., shows: Total number of passengers carried, 2,330,103; mileage, 563,168; receipts, $109,100.62; net earnings for the year, $14,071.93.

The longest trolley line in the South will soon be constructed between Atlanta and Douglasville, a distance of 35 miles. New York capitalists are backing the enterprise. This road has already been chartered, and it is the intention of the company to begin work at an early day on the line.

The report of the Binghamton, N. Y., Railroad Company for this quarter and the corresponding quarter last year shows: Gross earnings, 1896, $32,672.63; 1897, $36,626.06; operating expenses, 1896, $19,147.53; 1897, $19,961.71; net earnings, 1896, $13,525.10; 1897, $16,664.35; other income, 1896, $378; 1897, $955.81; gross income, 1896, $13,903.10; 1897, $17,620.16; fixed charges, 1896, $10,868.65; 1897, $11,997.18; net income, 1896, $3,034.45; 1897, $5,622.98. The general balance sheet shows assets of $1,318,915.70, including $1,276,622.10 for cost of road and equipment; $42,634.60 cash on hand. The liabilities include $395,270 capital stock; $839,858.71 funded debt, and $83,786.99 profit and loss (surplus).

The Kansas City, Lawrence & Topeka Electric Railroad and Power Company, which was granted a charter by the Secretary of State at Topeka a few days ago, with a capital stock of $3,000,000, has been organized under this charter in Kansas City, Kas. E. B. Purcell, of Manhattan, Kas., a former director and promoter of the Santa Fé Railroad, was chosen president; John G. Johns, a wealthy stockman and railroad promoter, of Houston, Tex., was elected secretary; Edward G. Anderson, an attorney, of Kansas City, Kas., was made assistant-secretary, and James Haggart, of Kansas City, Mo., was chosen treasurer. The directors are these four officers: Henry McGrew and W. L. Wood, of Kansas City, Kas., and T. E. Holmes and A. H. Gossett, of Kansas City, Mo. The company proposes to construct and equip an electric railroad from Kansas City to Topeka, a distance of about 60 miles, and operate it for both passenger and freight traffic. It also proposes to furnish electricity to the cities and towns along the line for manufacturing and lighting purposes. The work of securing the right of way for the railroad will begin at once.

Power Consumption on Electric Railroads.

The semi-monthly meeting of the Civil Engineers' Club, Cleveland, Ohio, was held in its room in Case Library, January 25, 1898. President Ritchie presided, and Mr. Samuel T. Dodd read the paper of the evening on the subject of "Power Consumption on Electric Railroads." He discussed the resistance developed by moving cars, and reviewed the formulas which have been in common use to express this resistance, and compared these results with a number of recent instances upon electric railroads. He concluded that modern experience shows that the old formulas, while giving results rather high at low velocities, give too small resistances at high velocities when applied to electric motors. The author also discussed the question of acceleration and the power required to bring the car to a certain maximum velocity, and the number of seconds in which this may be accomplished. He adduced instances from the practice of several of the inter-urban roads about Cleveland, and showed that about 400 pounds per ton was the maximum horizontal effort to be expected from the electric motor. The paper was accompanied with a number of diagrams and tables illustrating the subject.

The discussion was participated in by Messrs. W. H. Searles, secretary, James Ritchie, Joseph R. Oldham, and Walter C. Parmley, members of the club; also by Messrs. L. M. Sheldon and George M. Hoag, visitors. Mr. Germain, who is an engineer of the old school, being a venerable man over 80 years of age, but well preserved in body and still active in his mental faculties, then addressed the club, and gave some outlines of a method by which he would utilize the current of flowing streams to obtain power for generating electricity or other purposes. In this connection he had in mind the utilization of the river Jordan, which has a rapid descent, although devoid of waterfalls at any one point. He also described a plan of his for cooling the stoke-hole of an ocean steamer by distributing the current of cool air under the floor, allowing it to flow upwards through numerous openings.

The Tonawanda, N. Y., Street Railroad has been sold to Henry B. Smith for $50,000. The sale was the result of a foreclosure made by the Michigan Pipe Company, of Bay City, Mich. The company will now reorganize.

ROENTGEN-RAY NOTES.

BY WILLIAM ROLLINS.

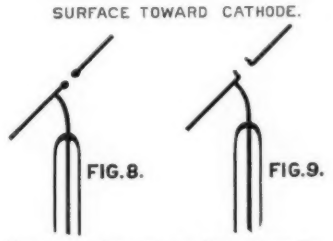
XXI—THE APPEARANCE OF AN UNCOOLED ANODE IN A ROENTGEN REFLECTING FOCUS TUBE.

In my attempts to find out what happens in a Roentgen tube I have spent considerable time in studying the appearances of anodes spoiled in use. Through the courtesy of Kirmayer & Oelling I have been able to examine the tubes returned to them for new anodes. Where the force has been only sufficient to gently melt the anodes, the edges of the holes are rounded as shown in section in Fig. 8. If the force has been enough to quickly give the molecules a freer range, the holes made in the platinum have edges toward the cathode, and are rough and jagged where the metal stiffened into points and ridges, as shown in section in Fig. 9. The bombarding molecules from the cathode have not driven the platinum in front of them, as we might suppose when our minds are fixed upon the cathode. They have been opposed by another force operating in a contrary direction. As this force increases with the degree of excitement in the tube and operates perpendicularly with the surface of the anode even when, as in a focus tube of the reflecting type, this is at an angle with the cathode, I have no doubt it is the molecular rush of the forgotten anode.

XXII—DR. WILLIAMS'S TUBE.

Dr. F. H. Williams has recently shown me the tube illustrated in Fig. 10. It consists of an aluminum bulb, with a rubber stopper, through which passes a glass tube with the anode sealed in. Inside the glass tube is a rubber tube, through which water was admitted, the waste escaping between the tubes. This tube goes back to the time when only newspaper accounts of Roentgen's discovery had reached this country, showing that cooled anodes had been thought of before I invented my A–W–L tube. The inventions are in a way different, because at that early day the amount of force used was too small to injure the anode, the object being to prevent the warmth of the anode from injuring the rubber stopper, while in my tube the target on which the anode discharge is received is cooled, because, with the great force I frequently apply, it would otherwise promptly melt. Using these tubes, I have been able to approach the conditions long ago reached by Mr. Tesla and described in paragraph 139 of Thompson and Anthony's invaluable work on X-rays, where the action of the generator is alone sufficient to produce a vacuum in a tube, and where in practice the vacuum rises so quickly that none of the commercial methods of adjusting are efficient.

Now, after allowing due weight to the other reasons already mentioned



UNCOOLED ANODES IN ROENTGEN REFLECTING FOCUS TUBES.

in these notes for the vacuum rising, we are brought face to face with that other extraordinary truth of Mr. Tesla's that molecules of residual air go out through the glass walls of a vacuum tube. So it becomes interesting to offer all the experimental evidence we can to illustrate this truth, and in a future note I shall give what I have accumulated as appearing to bear on the subject. Meanwhile it is worth while to point out where work should be done to find the best means of keeping a vacuum steady. Potash is not efficient, because when it has parted with its water it is inoperative, and this is soon when a powerful generator is used. First, we should leave only inert gas in the tube. Then we need a substance which, under heat or electricity, will give large controllable volumes of a suitable gas. This gas should have a high molecular weight in order that the momentum of the molecules may cause them to strike the target with force. As this will be treated more fully in a future note dealing with the means of using the velocity of the cathode discharge, I turn now to mechanical methods of controlling the vacuum. On some of my tubes I have used a special form of stop-cock invented by Dr. F. H. Williams. It is tight when not in use, and when the tube is running we can admit microscopic amounts of air by turning a valve a few times. When it is connected with a small bulb of suitable gas and used with a tube containing only gas which does not combine with the terminals, we have eliminated some of the causes of the rise, and have only to consider the Tesla effect. In some of my direct-acting tubes, shown in previous figures, instead of using a sealed-in window, I have gone back to Lenard's aluminum window, which has not yet been made tight by any plan suggested, so in running the leak compensates for the rise. But this method is not under control, and, when not in use, the end must be kept plunged under mercury.

XXIII—OXYGEN IN A VACUUM TUBE.

In searching for new lights by which to see that remarkable fact of Mr. Tesla's that molecules of the residual gases went out through the glass walls, I tried a number of experiments with different gases. Oxygen was chosen for one of these on account of its reasonably high molecular weight, and because I had reason to believe these molecules would be easier than some others to break under electric stress into electro-negative and positive groups, a matter of importance, because Roentgen light and smashed molecules go together. Whatever may be thought of this statement and of another, that it is broken molecules which go out through the glass, the experiments are of interest, for a Roentgen tube, in which the residual molecules are

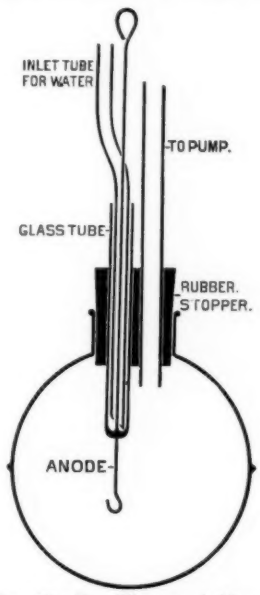


FIG. 10.—DR. WILLIAMS'S TUBE.

largely oxygen, is very bright and easy to exhaust, and also we have in stored-up oxygen the best means now known of regulating the vacuum. A simple way to prepare this stored-up oxygen is this: Mix four parts of chlorate of potash with one part of manganese dioxide. Heat them gently in a test tube until they form a coke-like mass. When cool, this is broken up into suitable pieces and placed in another tube, the end being sealed to exclude water vapor and gases. When required for use the tube is opened, a few grains of the mixture taken out and placed in a small bulb attached to a vacuum tube, which is then placed on the pump and exhausted to a high vacuum; heated to lower the vacuum, again pumped and heated, and this process continued until heating no longer lowers the vacuum. Then the little reservoir of stored oxygen is gently heated until the vacuum comes down. The pump is worked to raise the vacuum and the process repeated a few times. The tube is then sealed off. When in use the vacuum has risen, the reservoir of oxygen is gently heated while the tube is excited, until the vacuum is at the degree required for the special work on hand. Such a tube phosphoresces strongly after the current is turned off, and presents several interesting appearances which will be described if suitable half-tones can be made.

First Chinese "Hello Girl."

[*From the San Francisco Call.*]

San Francisco has a novelty in a telephone exchange for the use of the Chinese merchants of Chinatown (See ELECTRICAL REVIEW, January 5, 1898). Now, Ching Soy Sing is a modest-looking young man, but it is evident that he feels his position, for he says he is the first Chinese telephone "opellata" in the world. The Chinese who have had connections put in their places of business were at first a little nervous concerning the mystery of a voice sailing over a wire and would stand from the 'phone as far as the receiver would permit, but the "unnaturalness" of the system is gradually working off and seemingly all will be in working order before many days.

Ching's explanation of the workings of the telephone sounded like an act in "The First Born." He said in broken English yesterday: "No sabe voice walkee here, but I sabe fixee him for walkee, you bet. One man say, 'Bin ong ke ong sop.' I catchee plug, stab him on board and voicee walkee to me, then to 'nother China boy. One time no catchee 'nother man, I talkee 'Choy que ko.' Then 'nother man, sit down. He talkee me one time again and I talkee 'Mut ia ho so,' all same Melican man. What man you likee talkee? Next time may be catchee, then voice walkee. Wat's matter you bet, heap good. I likee, sometime, evelybody talkee all samee time. Wat's matta him. I no sabe again. Wha for he do that all timee? If hatchetman talkee, 'bout killee some more men, I hear him and tell 'nother man, you bet, I stop him voice walkee, and 'nother man no sabe nothing. I no likee talkee me 'hello gally.' Smart fello sometimee talkee me like him, 'nother man say 'hello gally' to me. Wha for? no sabe. Next time I stoppee him voice walkee, you bet."

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]

TIMES BUILDING, 41 PARK ROW,
P. O. BOX 2339. NEW YORK.

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REGISTERED CABLE ADDRESS:
"ELECTVIEW," - - - NEW YORK.
TELEPHONE CALL, 1546 "CORTLANDT."

WESTERN OFFICE:
CARL E. KAMMEYER, REPRESENTATIVE,
1627 Monadnock Block, CHICAGO.
TELEPHONE, HARRISON, 475.

WASHINGTON OFFICE:
GEO. C. MAYNARD, - REPRESENTATIVE,
800 H Street, N. W., WASHINGTON, D. C.

LONDON OFFICE:
HENRY W. HALL, - - REPRESENTATIVE,
42 Old Broad Street, LONDON, E. C.
News, Subscriptions and Advertisements.

Subscription to the
ELECTRICAL REVIEW.

One Year, United States and Canada, - - $3.00
One Year, Foreign Countries, - - - - - - 5.00
Single Copies, - - - - - - - - - - .10
Copies can only be supplied for one year back at 25 cents each.

SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, FEBRUARY 9, 1898.

Views, News and Interviews..... 83
An Electric Floor-Scrubbing Machine..... 83
The Telephone "Lang Syne"..... 84
Literary..... 84
Completing the Postal Company's Marine Cable System..... 84
American Electric Locomotives for London.... 84
An Electric Supply Dealers' Association..... 84
National Carbon Company..... 84
Electric Carriages in New York..... 84
Comments on the ELECTRICAL REVIEW..... 84
St. Lawrence Power Company..... 84
Personal..... 85
Illinois Society of Engineers and Surveyors.... 85
Telegraph Contracts in Mexico..... 85
Telephone News and Comment..... 85
News of the Trade..... 85
Michigan City Railway in a Receiver's Hands.. 85
Abstract of President H. C. Higgin's Address to the Northwestern Electrical Association.. 86
Electric Railway Notes..... 86
Power Consumption on Electric Railroads..... 86
Roentgen Ray Notes..... 87
First Chinese "Hello Girl"..... 87
Progress..... 88
A Wise Appointment..... 88
The New York Elevated..... 88
Wall Street and the Electrical Stock Market.... 89
Decision Sustaining the Van Depoele Trolley Patent..... 89
Late News..... 89
Explaining and Protesting..... 89
A Personal Exhibit by Prof. S. H. Short..... 89
Electrical Shop Transmission..... 90
American District Telegraph Company..... 91
Principal on Which a New Incandescent Lamp Will Be Made..... 91
A Memorable Anniversary..... 92
Electric Light Flashes..... 92
City Street Lighting..... 93
Massachusetts Charitable Mechanics' Association..... 93
A Duncan Meter Catalogue..... 93
News From the West..... 93
Electric Lighting for Profit..... 94
The Practice of Theory..... 95
The Chicago Department of Electricity..... 95
Advance Information..... 96
Kindred Interests..... 97
Electrical Patents..... 98

Advertisers' Alphabetical and Classified Index on page xii.

Dividends on electric properties are rapidly becoming the rule and not the exception.

The steam railways are gradually realizing the saving there is to them in electric traction. Their suburban lines are being equipped with this economical power at many important points.

PROGRESS.

The ELECTRICAL REVIEW is printing to-day editions 22 per cent larger than it was printing 60 days ago. This is done to meet a growing demand.

The number of advertising patrons now using the ELECTRICAL REVIEW has increased a little more than 24 per cent in 60 days.

In spite of the fact that the ELECTRICAL REVIEW is not what is generally known as a "returnable" paper, the news-stand sales have substantially increased since January 1, the increase averaging about 15 per cent.

These are evidences that the new form of the ELECTRICAL REVIEW is meeting with popular approval, satisfying both the reader and advertiser alike.

We cast this little nosegay in our own direction to be read as an acknowledgment of the many congratulations and inquiries from considerate friends in all parts of the world.

We commend to the attention of electric railway men, especially, the interesting article by Mr. George Heli Guy, published in the New York *Evening Post*, for February 3, under the title "A Memorable Anniversary." The article fittingly celebrates the tenth anniversary of the commercial establishment of electric street railway traction.

Why do we not hear more about magnetized watches? Perhaps, like the fishwoman's skinned eels, since the use of electricity has become so universal, the watches have become "used to it."

Circular Johnston claims that 24 and ¼ pages in his pale-green publication brought more returns than $\frac{13}{16}$ of one page in the *Electrical Age*. We can not believe it!

Electric heating is making strides every day. There is much good work being done in this field by Boston and Philadelphia manufacturing companies.

A WISE APPOINTMENT.

The Third Avenue Railroad Company, of New York city, is to be congratulated on securing the services of Dr. Louis Duncan, of Baltimore, as consulting engineer. The company, we understand, contemplates the expenditure of about $6,000,000 during the next two or three years in the installation of electric traction on its existing lines and others to be built. Where such large interests are involved it is always the part of wisdom to secure the best obtainable engineering talent. Dr. Duncan stands to-day as a type of all that is best in modern electrical engineering. He is a graduate of the Naval Academy and of Johns Hopkins University, and has had a wide range of practical experience. He is in charge of the electrical engineering course at Johns Hopkins University, where his abilities as an instructor are highly valued. He served two terms as president of the American Institute of Electrical Engineers, and has held the responsible post of consulting engineer in a large number of important electrical projects. It is safe to assume in advance that the electrical plant installed by the Third Avenue Railroad Company, under Dr. Duncan's able supervision, will conform in every detail to the most modern practice.

THE NEW YORK ELEVATED.

As observed in a recent issue of the ELECTRICAL REVIEW, the announcement made a few weeks ago that the Manhattan Railway Company, of New York city, had placed contracts for its electrical equipment was premature. President George Gould seems to be proceeding with caution and conservatism. A committee has been appointed from the company's board of directors to consider the many problems involved in a change of motive power and the extension of the elevated railway system. An official correspondence is in progress between Mr. Gould and President Orr, of the Rapid Transit Commission, which will result during the next few days in the consideration of plans for the connections, extensions and additional tracks and facilities desired by the Manhattan Railway Company. It is pretty certain that contracts for electrical equipment will not be signed until all these important preliminaries have been settled and the committee and its engineer have had a chance to confer with the electrical manufacturers. But the ball has been set rolling, and the people most vitally interested are working hard. Electric rapid transit for New York city looms big in the near distance.

The third-rail electric system between Berlin, New Britain, and Hartford, Ct., on the New York, New Haven & Hartford Railroad, passed through the blizzard last week without a hitch and with flying colors. The snowfall was so heavy as to completely stall trains on many of the steam railroads throughout New England, yet the trains running on the electric system maintained their schedule time throughout the day. It was an opportunity for a severe test, which all advocates of electric traction for short steam roads have been awaiting with interest, and it is a matter for congratulation that the test was so successfully met.

Mayor Harrison, of Chicago, through his newly created city electrical department, has notified the local telephone, telegraph and other electrical companies that he will cut down 4,000 overhead wires, unless steps are taken to place them underground before March 1. The companies owning the wires will undoubtedly be glad to oblige the Mayor, but the days of grace allowed them are rather few. In the meantime, the Mayor might well occupy his time in cutting off the official heads of 400 of Chicago's alleged policemen, who have been lately indulging in little "hold-up" games of their own.

In the case of Kunz against the Brooklyn Heights Railroad Company, Justice Wilmot M. Smith, in the Supreme Court at Brooklyn, N. Y., has decided that electric railway companies may enjoy a joint track organization, basing his decision on the "Kingston traffic case."

Wall Street and the Electrical Stock Market.

The total business done in bonds during January was the greatest on record and the past week's transactions have also been of considerable magnitude. They show clearly the extent of the capital now seeking investment, and in the opinion of shrewd financiers, point to a most significant fact—the dawn of an era of low interest rates in this country.

Of the local traction stocks, Metropolitan Street Railway sold up to 148½, which is the highest price on record. The stock was bought on reports that the company's earnings were exceedingly good. The substitution of electricity as motive power on some of its lines has resulted in greater earnings than were hoped for, and suggest further similar changes by the management as soon as practicable. Manhattan, after showing some strength on Mr. Croker's statement that if the Rapid Transit Commission refused to give the company what it asked for, the City Council would, showed a tendency to decline, in view of the threats that the Commission would take the matter into the court. Good opinion in Wall Street, however, believes that the situation has been "fixed" so far as the management of the company and the political powers are concerned. Nothing new has developed in reference to the contracts for equipping the system with electricity.

North American was quiet, with the exception of Thursday when 3,000 shares of the stock sold at 5¾ to 6⅛. Advices from Milwaukee are rather favorable to the company inasmuch as the Common Council has practically made the Milwaukee Electric Railway and Light Company secure from projected competition. The North American Company's assets consist of preferred stock of the Milwaukee Company valued at over $4,000,000. A dividend is expected out of the earnings of the last quarter.

General Electric was the leader of the electrical stocks. After ruling quiet during the week, it developed considerable activity to-day, 17,000 shares changing hands, and the price rising from 37⅜ to 39½, the highest figures in some time past. The total advance for the week amounting to 3½ points. The activity and advance to-day are attributable to the circulation of a report that the company's management had made important progress in arranging with the holders of the preferred stock for the conversion of the arrears in dividends into debenture bonds, an operation, which in view of the present large earnings of the company, would clear the way for dividends on the common. However, I have it from the highest authority that the report is incorrect and that no such plan has been acted upon by the directors.

On moderate transactions Western Union advanced 2 points to 92¾ on Friday closing at 92½. There was practically no news on the property. American Telegraph and Cable was bid 91 offered at 92, Commercial Cable bid 175, while 5,000 of the four per cent bonds sold at 95 on Thursday and Edison Electric Illuminating of New York sold at 133 to 133½.

On the Boston Exchange Bell Telephone, although inactive, gained 2 points during the week closing at 268, Erie Telephone ranged between 72 and 73, General Electric preferred was bid 89 offered at 90, and New England Telephone closed at 131, a net gain of 1½ points.

On the Philadelphia Exchange Electric Storage Battery stocks were dull and lower, the common selling at 24½ on Thursday and the preferred closing bid 27½ offered at 29. Pennsylvania Heat, Light and Power was steady around 21½.

Erie Telegraph and Telephone dividend of one per cent, quarterly, will be payable on February 14.

The annual meeting of the Commercial Cable Company will be held on March 7. Books close February 24 and reopen March 8.

The report was current in the Street during the week that at the annual meeting of the Edison Electric Illuminating Company to be held shortly, a stock dividend would be declared.

Boston advices report the instrument output of the American Bell Telephone Company for the month ending January 20, at 25,861, an increase of 11,424, as compared with 1897, bringing the total outstanding up to 938,073, or an increase as compared with last year of 156,188.

RAY.

Wall Street, February 5.

Mr. Chas. S. Knight, vice-president and general manager of the Fort Wayne Electric Corporation, has been a resident of New York for two weeks past, a guest of the Waldorf-Astoria. Mr. Knight is spending this week in Boston, where his company's interests are ably looked after by Mr. E. I. Garfield.

Decision Sustaining the Van Depoele Trolley Patent.

Judge Lacombe on Monday, February 7, handed down a decision in the suit of the Thomson-Houston Electric Company against the Walker Company and the Union Railway Company, sustaining the broad claims of the Van Depoele trolley patent, being claims 2 and 4, and ordering an injunction against the Walker Company and the other defendants. The order, however, directs that the injunction, when issued, shall be stayed for 30 days, to give defendants an opportunity to review the decision at this term of the Court of Appeals.

This decision is one of the important railway patent decisions of recent years. The patent involved has been in litigation for several years. At the first trial, certain of the claims, narrower than those involved in the recent decision, were sustained by Judge Townsend. His decision was reversed by the Court of Appeals upon technical grounds.

Judge Lacombe holds in his opinion that the technical objections, on the strength of which Judge Townsend's decision was reversed by the Court of Appeals, do not apply to claims 2 and 4, and, accordingly, that the validity of the patent must be sustained.

The only manufacturers licensed under the Van Depoele trolley patent are the General Electric and Westinghouse companies. They attach a special importance to this decision, coming as it does upon the heels of Judge Wheeler's decision of a few days ago, sustaining their motor suspension patent.

LATE NEWS.

The Baltimore City Passenger Railway and the Central Railway Company, of Baltimore, Md., have consolidated, and the stockholders of both companies will be called together to ratify the consolidation.

An agreement has been entered into between the Builders' Iron Foundry, the Rice & Sargent Engine Company and the Providence Steam Engine Company, all of Providence, R. I., by which the interests of the three companies are to be combined for the next five years. Officers of the Builders' Iron Foundry have taken charge of the steam engine companies.

Application has been made for the appointment of a receiver for the Hudson Telephone Company, which was organized in Jersey City, N. J., about a year ago. Manager G. H. Atkinson filed his resignation with the Board of Directors about a week ago, and the president, Charles B. Thurston, resigned last Friday. A large number of the stockholders have been at variance with the managing officers.

EXPLAINING AND PROTESTING.

Our brother publisher of the pale-green *Electrical Earth* is quite busy. He is engaged just now trying to explain away by means of a few tons of circulars, and labored English in his news columns, the recent exposure of his method of securing "unsolicited" testimonials by begging them of people on the street, and in protesting that his suggested system of "keying" advertising returns is really unselfish and honorable. For a man so virtuous he protests too much.

It does not seem exactly fair that our good brother's system should land the ELECTRICAL REVIEW'S patron, by means of a false address, on that lonely Hudson River pier, with cold weather coming on and an ice gorge due any day.

Still we are complimented—to the extent that anything from such a source may be so considered—by the fact that the p. g. publisher announces in one of his circulars that *two* announcements in the ELECTRICAL REVIEW test the "relative merits of electrical journals," as compared with *thirteen* in his very pale-green *Electrical Earth*.

The record stands that Johnston started to perpetrate a trick, was exposed, and now squirms and squeals.

A Personal Exhibit By Prof. S. H. Short.

In addition to the exhibit which will be made of all its modern apparatus for the generation and use of electricity, by the Walker Company, of Cleveland, Prof. S. H. Short, its electrical engineer, well known as a distinguished and successful pioneer in the electric railway field, will make a personal exhibit at the May Electrical Exposition in New York. For some 15 years Professor Short has been actively engaged in railway design and invention, and as far back as 1885 organized a company in Denver which laid and operated a slotted conduit railway. His work will now be interestingly and richly illustrated by pictures, relics, models and old apparatus, and will constitute one of the features of the occasion.

ELECTRICAL SHOP TRANSMISSION.*

BY H. G. DIMICK.

Under this title all the various kinds of transmissions might be classed, but it is not the intention to burden you with such an exhaustless subject. This paper will be confined largely to a plain two-wire 220-volt system, and motors belted to line shafting in the various departments of the shop in question. The other systems used to some extent are 220-volt three-wire, the 500-volt direct current and the alternating current. Besides connecting motors to line shafting, there is another practice which is used to some extent, that is, connecting the motors direct to each machine requiring power, doing away with all line shafting and countershafts. This method may be the most economical as regards the amount of power used, especially where the machines thus connected are not run constantly. There is more or less of this class of machinery in all factories.

But the first cost of such a system is something which bars it in most cases unless the machines require not less than five-horse-power units to drive them; here the extra cost question will not become so great since motors can be purchased at an average price per horse-power.

The two cases which generally come under the engineer's charge are; first, the changing from the old belt or rope drive to motor driven; second, the equipment of entirely new shops and machinery with motors. The writer would prefer the latter after his experience with the former. The first is to be met with most frequently from the natural condition of our industrial and manufacturing world. When changing from the old rope drive to motors it is very desirable, and sometimes even necessary, that the change should be made with little or no loss of time in operating the factory. This offers the chance for considerable ingenuity and engineering on the part of the electrician and millwrights; for they seldom find the conditions the same for any two cases. The above-mentioned difficulty, coupled with the extra trouble of having to go around old fixtures with the wiring, and locating centers of distribution, fuse cut-outs, starting apparatus, etc., makes it more difficult and expensive to install such a system than to start in with everything new. But it is sometimes still more difficult to convince the owners of this fact until they have paid the bills.

* Read before the Chicago Electrical Association, January 7, 1898.

The laying out of such a plant or system requires considerable time, attention, ability, and arranging of details before the real work can be done, such as the location of cables, motors, starting outfits, centers of distribution, fuse cut-outs, or branch blocks, measurement of distances, etc. After all this has been done one still has the great question to decide—"how much power does each department require? What will be the minimum, maximum and average loads, and how much to allow for growth or enlargement in future equipment?" In many cases he must make assumptions for these and go ahead. When these are decided one can lay out his power plant and determine the size of our generator. Here the writer can only reiterate what is practiced in all modern power plants, namely, put in as large units as possible, and have at least one reserve machine, especially where the plant is kept running 24 hours per day.

It will also be found practical to have one small unit of 50 or 100 kilowatts to run in cases of very small load, and for extra overtime work. Of the other details of the power plant, such as boilers, fuel, pumps, condensers, feed-water heaters, steam and exhaust piping, engine regulation and economy, constant voltage, recorded daily load, efficiency, switchboard, etc., little need be said as most engineers are familiar with such specifications already and know what they would specify if the opportunity offer. The changing from an old equipment, which is partly electrical and partly rope-driven, opens another valuable field for designing temporary apparatus with the least expense, and this will be found quite difficult when one has 2,000 or 3,000 amperes to collect and distribute on a dozen or more circuits. The methods of accomplishing this may be numerous, but the means used are generally indescribable. Those who have done such work would rather have it remain undescribed than to give a very exact description of its appearance. And now to go into our subject a little more in detail. Before describing any apparatus, the writer wishes to say that it is, or was, much easier to get out of difficulties by being in a place where they could design and manufacture just what was asked for, than to be in a position where one could only get what was on the open market, especially if that market be 400 or 500 miles away, and material had to be shipped from there.

The switchboard should contain the usual outfit for the generators and circuits, such as fuses, main switches, with or without equalizer blades, circuit breakers, single or double pole field switches, rheostats and ammeters, a voltmeter for the bus bars, and one for a combination switch, whereby all the machines may be connected with it, when they are to be thrown in parallel. A recording ammeter or wattmeter in series with the bus bars is also a useful adjunct if it records correctly—as is also a recording voltmeter. The distributing switches should be fully equal to their rated capacity, for times will come when it will be well that they are large. An ammeter in each circuit is also desirable, as it will save many future tests; then there should be suitable provision for a ground test through the voltmeter. This is sometimes accomplished through the regular combination voltmeter switch. A good supply of pilot lamps will also save much guess work in operating a board.

The methods of connection on the board may be varied somewhat, but they must conform to plans already well known to most of us. For connections from generators to board, good lead-covered insulated cable should be used and run under the floor. It will be found much easier and convenient to use cables of not over 800,000 circular mills cross section, for if the unit is a large one two, three, or four of these may be run in parallel for each side of the circuit, and the work can be done in less time, and less copper used than when one large conductor is used. The same can also be said of running large feeder circuits to various points. Now for distribution from the board. Having the load at the different points, and the distances, the next question is to determine the drop and size of cable to produce that drop; then the kind of cable; and when we say cable, we mean stranded conductors, of which there are practically two kinds in use to-day; the rubber covered and lead pipe covered, the insulation of which may be rubber or other material. There are numerous ways of putting up large feeders, chief of which are on glass or on porcelain insulators, on special clamps, in iron-armored conduit and lead-covered cables in plain iron pipe. The two latter methods are by far the best as well as the most expensive, which is as it should be. The only objection worthy of note is that one can not tap into a circuit as neatly and as cheaply as in exposed work, while the chief advantages are that the cable will always be insured against injury and abrasion. They will stay in place and not be liable to be broken down, and the unsightly sags and loops are once for all eliminated. Having the cables in, the next step is to properly seal or solder the terminals. With rubber-covered cables this is comparatively easy, for they can or should be soldered or clamped directly into the fixtures. These should be made to fit them, for they seldom do fit unless made after one has the cable to go by. With lead-covered cables, whose insulation is not filled with air and water-tight compounds, an extra large lead sleeve must be wiped on the end of the cable and filled with some compound which will not melt and run out on account of the heating from heavy loads or short circuits on the line, when the sleeve points downward or horizontal. We have yet to see the ideal method of dealing with this case. We are not ready for the sub-dividing apparatus, and a good method for this requires that there should be a switch and plug fuse for each motor-circuit on each floor at the point of junction with the main risers or feeders, but it costs money to do this, and we can dispense with the switches but not the plug fuses, although plants have been put in and many of them with nothing but plain fuse branch blocks. Whether the first or second plan is adopted, a small distributing board may be designed with a uniform plan for any number of circuits desired, and much time will be saved afterwards by its use. The diagram of the first-named board will look something like Fig. 1. Another branch block, which can be used in rooms at the ends of sub-feeders from the boards just described, was very useful where more than one motor was required. In diagram it looks like Fig. 2. It is on a slate base, very durable and not expensive, considering the number of outlets. It was fitted for plain fuses, but it should have a plug switch or fuse and a fireproof cover, according to rules. When rules are mentioned, of course we all know what rules, and a word in regard to their use may not be out of the way. The writer had one of their books and could tell nearly everything in it, and also knew of several established uses and customs among the inspectors, but he had at the very least a hundred and one cases where he had no rules to go by and had to go ahead and use his own judgment, or send over to the City Hall and wait a week or two before he could get an answer and proceed with his work.

We are now to the motor-starting apparatus. This should be uniform in style for the whole system; and to accomplish this, individual motor-starting switchboards should be built of uniform size on slate or similar material. The following apparatus should be placed upon it: a switch, a fuse, a starting box or rheostat, pilot lamps and an ammeter. This last is not absolutely essential, but it enables one to see quickly if the motor is overloaded, and is worth the extra cost. The arrangement, design and connections of this board can be left to the person in charge to suit himself, and he can not make a very serious mistake in it. The principal part of this outfit is the starting-box or rheostat. It has been mentioned in an older paper, and it will bear repetition here. "In the first place, put in a motor that is large enough to do the work without straining it or overloading it. In the second place, secure a good automatic starting rheostat; on these two points hinge the success of motor transmission."

When we take into consideration that we have from 100 to 150 motors in operation, and as many starting-boxes, and if the circuit breakers open on the generator, all these rheostats must automatically return to "starting point," we see how perfect our rheostat should be, and the writer has yet to see the rheostat that will always do it. Same attendant will have his switching lever tied up or tied down, which ever the case may be, and there will be a chance for an armature burn-out when the

current is turned on again. The writer has had experience with three or four different makes that are on the market, and they are all subject to all sorts of trouble. Some of the old-style starting equipments, whose rheostats were not automatic but operated by hand, are all right, but the risk of burn-outs and the fact of one plain, perfectly understood rule in the underwriters' book compels us to drop their use for "would be" automatic ones. An automatic rheostat means one which will open the armature circuit automatically whenever the current ceases to flow from any cause whatever, and makes it impossible to start again without first having all the resistance in circuit. Lately this has come to include overloads also, which means another contrivance similar to a circuit breaker on each rheostat. The principal specifications for a good automatic-starting rheostat should be something like this: It should be thoroughly fireproof; the different steps of resistance should be properly proportioned, to avoid injurious sparking at the switching segments and allowing too great a difference of current to flow in the armature before it is up to speed; the switching segments should be comparatively large and massive; the contact arm should be easy to work and the contact piece itself should be the point of wear and tear, easily removable and cheap. These segments and the moving contact should be kept clean and free from all burned spots by the attendant, otherwise it will be out of order in a short time; and this is the owner's part to perform. The automatic part usually consists of a magnet holding the contact lever in the position where the resistance is all out, and when the circuit is opened from any cause this magnet releases the lever, and a spring or gravity throws it back to the starting position. Another magnet, or the same one, performs a similar function when an overload comes on the motor. These magnets are connected in series with the field, in series with the armature, or across the feeder terminals. The two most common troubles are the failure of the automatic to work when it should, or it works when it should not, and the burning of the switching segments or contact. The minor troubles are the burning out of the resistance coils or magnet spools, breaking of springs, loosening of screws, overheated contacts, and many other little things that will get out of order. No one can appreciate all the troubles that will arise until he has the care of a hundred or more of them of varying sizes and diversity of manufacture for a few months. He will find all the troubles enumerated and more. Therefore a boom, financial and electrical, awaits the man who will design and manufacture for sale automatic-starting rheostats that will run all sizes of motors equally well and be without half of the troubles already mentioned.

And now a few words in regard to the requirements of the motor. The principal thing to consider is the kind of work it has to do; that is, whether it is to have a steady load all the time, or if it is to run a heavy load for a few hours, and then at half load the balance of the time, or whether it is continually changing from almost no load to full or overload every few moments, and

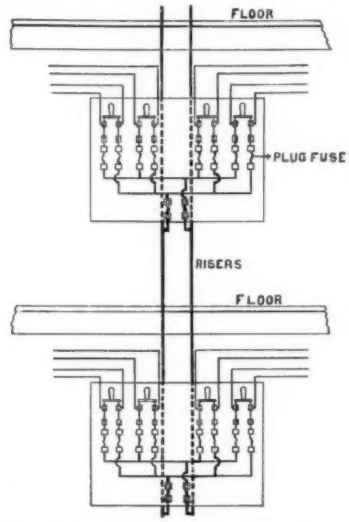

FIG. 1.—SMALL DISTRIBUTION BOARD FOR ELECTRICAL SHOP TRANSMISSION PLANT.

whether it is reversed very often and quickly. Then we must determine, if possible, from figures, comparison or otherwise, the real full load and average load in horse-power. For the first class of work spoken of, get a motor whose rated capacity is about 10 per cent more than the load expected to be put on it. For the second kind of duty spoken of, get one whose rating is about 15 per cent

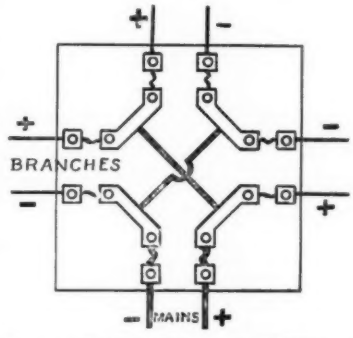

FIG. 2.—BRANCH BLOCK FOR ELECTRICAL SHOP TRANSMISSION PLANT.

more than the load. For the third class of duty, get a motor whose rating is 20 to 25 per cent larger than the load to be handled. Of course the value of these ratings depends very largely on the style of motor and the manufacturer's method of design. The writer believes in putting in motors by this rating even if it does cost a little more and a little is lost in efficiency, for the motors will be heavier, run slower, run cool without injurious heating, and the coils, brushes and commutators will last longer. The item of commutators is no small one when one takes into consideration the price of a new one and the time of waiting for it to be put on. Another reason why large motors should be put in is that in large manufactories there is always room made to put in a few more machines to be driven. Although one may believe he has figured in everything possible at the beginning, somehow they always manage to put in more machinery requiring power, and all concerned are better satisfied if the motor already in is able to carry the load without working on an overload. This will hold true in nine cases out of every ten. In conclusion, when the plant is once completed and has been running a few weeks one will begin to see whether his calculations as regards the power required have been true, and small changes will need to be made to fit abnormal conditions that he could not foresee. A series of tests should be made on all points where there is a possible chance for betterment, such as the voltage, belt friction, line shaft friction, etc. Apparatus can be arranged cheaply to test the amount of power consumed by each separate machine, so that one will know just what each machine consumes in doing its work, and thereby add to the cost of the article the cost of the power required to produce it. Of course this means a little expense, but we must have our electrician around, and we must have something for him to do so that both parties concerned will be prepared with the experience for future operations. The writer could go on and give the number of watts consumed by various classes of machines, but it would only be for the case in question, and would not fit any others, for they will all differ largely.

Suffice it to say that the wind or air moving machinery is by far the most prodigal of power. This class includes cupola blowers, pressure blowers, large exhaust fans, dust and shavings collectors, etc. Taking all in all, shop transmission probably gives rise to as many problems of construction as any other branch of electrical engineering, and is a distinct class of work in itself, to be met and dealt with in the best possible manner, and then wait for experience to prove the need of something simpler, cheaper and better.

American District Telegraph Company.

The annual report of the American District Telegraph Company for the year ended December 31, 1897, shows a total income of $548,128, an increase of $2,288 over 1896. Operating expenses and construction show a substantial decrease so that net revenue in 1897 was $18,005 more than in 1896. The dividends paid were $76,882, or double the previous year's. The report shows that the company is in good condition. At the annual meeting the board of directors was re-elected. The latter, in turn, elected T. T. Eckert, president; Chas. A. Tinker, vice-president, and C. A. Schivlier, secretary and treasurer.

Principle on Which a New Incandescent Lamp Will be Made.

As the result of some years of practical tests with all kinds of incandescent lamps, during which time the company are said to have renewed over 700,000 incandescent lamps, the Lynn Incandescent Lamp Company, of Lynn, Mass., have decided to make in connection with their established work an entirely new lamp to be known as the "Lynn." It is aimed to have the lamp embody the best features resulting from the examinations and tests of lamps of many manufactures, utilizing the best features of the "Lynn" renewed lamp for life and sustained candle-power. The principle of the best filament, according to this company, is that it is the "flashed surface" on the filament which wears, and the vacuum which prevents the escape of heat, so that the power put into the filament is turned into light and not heat, thus making the length of life and efficiency; also when the flashed surface and vacuum are equal one lamp is as good as another provided other features such as collar and mechanical construction are correct. The filament used in the "Lynn" lamps is not of the usual cellulose type, the theory being that they do not admit of a sufficiently flashed surface, its resistance being too low at the start.

The efficiency of the lamp, or the amount of power it takes per unit of light, depends on the size of the filament, in the same manner that the amount of steam a pipe will carry depends on its size and the pressure in pounds behind it. In the case of the "Lynn" product, it is claimed that the vacuum serves the same purpose as asbestos packing on the pipe.

A four-watt carbon is quite large, and a 3.1-watt carbon very slender. Consequently, it is necessary to burn the latter at a much higher temperature to give the 16 candles.

Now, the brighter a lamp burns the sooner will the carbon be disintegrated, and this, of course, means a shorter life. The flashed surface is much more durable than the core, so the value of a heavy "surface is apparent."

The Lynn Incandescent Lamp Company do not claim their new lamp to be better than their renewed lamp, except in uniformity of appearance and general workmanship. They are simply supplying the demand of critical consumers for a uniform, efficient and high-grade lamp, equal to their renewed lamp in life and sustained candle-power.

A MEMORABLE ANNIVERSARY.*

IT IS ONLY TEN YEARS SINCE ELECTRIC TRACTION WAS COMMERCIALLY INAUGURATED.

BY GEORGE HELI GUY.

The extraordinary extent and rapidity of the development of locomotion by electricity is one of the marvels of our time. The electric current has come much more quickly into general use for transportation than for lighting purposes. It is 20 years since Edison perfected the incandescent lamp, and 25 years since arc-lighting was first adopted. Surprising as it may be to most people, it is nevertheless a fact that this is only the tenth anniversary of the day on which the feasibility of regular electric street railway service was first fairly and commercially proved in this country. It was on February 3, 1888, that this notable event took place on the lines of the Union Passenger Railway Company, of Richmond, Va. It seems fit on this occasion to relate the story of the first efforts in this field, as well as to summarize the wonderful growth in a single decade of this new mechanical art to its present stupendous proportions.

It is no exaggeration to say that the story of the Richmond road is one of the most thrilling recitals of the triumph of pluck and brains over apparently insurmountable obstacles to be found in industrial history.

The contract called for the completion in 90 days of the equipment of a road with 12 miles of track; the construction of a complete steam and electric station plant of 375 horsepower capacity; the furnishing of 40 cars, with 80 motors, and all appurtenances necessary for their operation; 30 of the cars were to be operated at one time, and grades as high as eight per cent were to be ascended. The nerve required to take on hand such a task as this at the then immature stage of the industry becomes even more incredible in the face of Mr. Sprague's admission that "when the contract was signed we had only a blue print of a machine and some rough experimental apparatus. The hundred and one details which were essential to success were as yet undetermined. Such a contract is one which no business man would ordinarily assume, especially in view of the entirely unprepared state of the company. But it was justified by subsequent events, because of the pioneer character of the work. Fortunately for the future of electric railways the difficulties ahead could not be foretold, or the contract would never have been closed. Enormous as was the expense incurred, however, and grave as were the risks encountered, they have been entirely justified by results, for the Richmond road stands as the prototype in almost every essential detail of the modern electric trolley system."

The contract was made in May, 1887, and in the following July Mr. Sprague was down with typhoid fever. When he fully recovered, early in October, he hastened to Richmond, to go over the route and note the conditions of the work which had been going on during his illness. Up to that time he had never seen the road. Much of the track-work had been finished, poles had been set, and some of the machines constructed; the central station was well under way, and a great deal of experimental work was in hand. The owners of the road were clamorous to begin operations, and the excuses of the company for delay were almost exhausted. The situation is graphically conveyed in Mr. Sprague's own words. He says:

"I shall never forget the feeling I had when, returning from the improvised car-shed, I stopped at the foot of Franklin street hill. As I looked up this incline under the bridge connecting the Ballard and Exchange Hotels, and saw a grade varying from four to ten per cent rising above the bridge, I was for a moment doubtful of the outcome, and I began to realize the difficulties, not only those incident to our own work, but others forced on us by the unusual and unforeseen conditions under which we had undertaken it. The track was simply execrable, laid for profit, not for permanence, and with no idea of the necessities. It was a flat 27-pound tram-rail of antiquated shape, poorly jointed, unevenly laid in red clay, and insecurely tied together. A part of the 12 miles of track was double, the rest single. Some of it was laid on paved streets, but the greater part was on macadam or unpaved streets. There were 29 curves, five being of less than 30 feet radius. On these sharp curves were grades as high as eight per cent; and there were straight grades as high as 10 per cent. The outer rails were often inches below the inner ones, and the whole track at times would disappear into the red clay, which froze over it and stuck with remarkable tenacity. Our car-house was an open lot, in which were two roughly covered sheds.

"We had undertaken the problem, at that time entirely new, of gearing motors independently to each axle, carrying them under the car, exposed to dirt and moisture, to control them from either end by new methods, to run with fixed brushes in both directions, to operate without rheostats, to use a 450-volt constant-potential circuit under conditions which were stated by electricians to be impossible, to operate a multiple-arc circuit on a large scale, which was deemed equally impracticable; to use a trolley wire of small size supplied at intervals by a system of large conductors, and to mount grades which we found much more severe than we had contracted for, and which had also been pronounced by street-railway men and electrical engineers as impossible of ascent by a self-propelled car. The sight of this grade, as I have said, was probably one of the most unpleasant sensations in my experience. I felt that there were two things probable: First, that the car would not ascend the grade, no matter how powerful the machines, for lack of track adhesion; and, second, that the machines were not powerful enough, even if the wheels would cling to the track. But we were face to face with the problem and it had to be solved. Our first machines had been built with one reduction of gearing, to which all street-railway practice is now gravitating. An eight per cent grade would strain them, and a 10 per cent would probably be fatal."

Mr. Sprague went back to New York, and a council was held. The most direct remedy which suggested itself was the introduction of an intermediate gear for the motors under the cars. Before deciding on this, Mr. E. H. Johnson, the president of the company, "guessed the best thing to do was to find out whether the car could get up the grade at all." Mr. Sprague went back to Richmond to find out. The trial trip was made at night about nine o'clock, with Mr. Sprague, S. Dana Greene, General Manager Burt, and other employés on board the car. As Mr. Sprague describes it:

"A short distance from the end of the line we stopped in the middle of a very sharp curve. Burt thought we would not get out of it; I said I would if I wrecked the machines, and out of it the car came. Arriving at the foot of the hill we stopped, and I said, 'Burt, we won't make it.' He said: 'You will; if you can get out of a curve such as that we left, you can go up the side of a wall.' If we succeeded in climbing the hill, I knew what would happen to the machines, but it was vital to know whether a self-propelled car could be gotten up that grade. We went steadily up until we got to the top of that and another hill, and had gone around several curves, finally reaching the highest point of the line in the heart of the city. We stopped here, for I knew that everything under the car must be pretty nearly red hot, and an enthusiastic crowd soon gathered around us. Of course, I was willing that they should inspect the car, for all the time I was in hopes it would cool down sufficiently for us to continue our journey.

"But my hopes were doomed to disappointment. No sooner had we started than I felt that peculiar movement, then strange, but afterwards very familiar, due to a crossed armature, and I knew that we were disabled. We ran along a block in our crippled condition, and then I stopped, while a howling mob, numbering two or three thousand, seemed bent on taking possession. It would never do to confess serious trouble, and so I told Greene in a tone that could be overheard by those near me, but apparently showing no concern, that we probably had some slight trouble with the circuits, and I thought he had better go and get the instruments, so that we could locate it and put things to rights. Then I turned out the lights and laid down on a seat to wait, hoping that the crowd would disappear. After a while Greene returned with 'the instruments,' four big powerful mules, the most effective instruments which we could find in Richmond under the circumstances, and we began our retrograde journey."

*Abstract from the New York *Evening Post*, February 3, 1898.

ELECTRIC LIGHT FLASHES.

Rock Rapids, Neb., has completed the construction of an electric lighting system at a cost of $17,598.35.

The Ventura, Cal., Land and Power Company's incandescent light and ice plants have been destroyed by fire at a total loss.

The Connersville, Ind., Gas and Electric Company's plant was sold at public auction a few days ago for $8,000, it being bid in by the bondholders.

A reduction of 25 per cent in the cost of electric lighting is soon to go into effect in Orange, Pa., and, it is said, this will bring the light down to the cost of gas.

CITY STREET LIGHTING.

A REPORT TO THE CITY OF DES MOINES, IOWA.

Mr. Fred L. Barrett, superintendent of street lights of Des Moines, Iowa, has submitted the following report to the Mayor and City Council of Des Moines:

At the request of the Board of Public Works I accompanied them upon their recent trip to St. Louis, Mo., Detroit, Mich., Buffalo, N. Y., and Chicago, Ill., upon their tour of inspection. My interest was solely one of inspection and examination of the methods employed in lighting the streets, the service rendered and the cost therefor, and these observations I desire to submit to you.

St. Louis, Mo.—The first city visited was St. Louis, Mo. Here electricity, gas and gasoline are employed for street lighting purposes.

Electric Arc Lamps—Number of lamps in use, 2,900; cost per lamp to the city, $74.95. Lamps are hung on the corners of streets at a height of about 40 feet, there being one lamp upon the corner of each block or intersection. It was noticed here that the service rendered by the electric lighting company was extremely poor. In commenting upon this with an official, it was stated that the price was so low that the company could not afford to render better service; in fact the company was willing to surrender its bond rather than to carry out the terms of the contract, at the contract price of $74.95. This contract, I believe, runs for a number of years yet. Total amount paid out for arc lamps during the past year was $217,345.94; amount of the appropriation, $255,000.

Gas—The number of gas lamps equipped in the city is 987, and are burned outside of the district covered by arc lamps. Price paid for all-night and every-night service is $37 per lamp per year. The amount expended last year for gas alone was $36,497. This price is one made by contract several years ago, which contract has not expired.

Gasoline—Number of lamps in use are 168, run upon moonlight schedule, the price paid being $27.96 per lamp per year, the appropriation for this particular service being $4,703.56. It will be noted that with the exception of arc lamps the price of gas and gasoline lamps is extremely high, but may be accounted for by reason of the fact that the companies are working under an old contract. Neither the electric light, gas or gasoline service is the equal of Des Moines.

Detroit, Mich.—The next city visited was Detroit, Mich. Here the city owns its own plant and performs its own lighting.

Number of arc lamps in use, 1,600; capacity of plant, 2,000. The cost to the city the first year was $87.40 per lamp; the cost to the city the second year was $89.42 per lamp; the estimated cost for third year was $94 per lamp.

The gradual increase in cost of operating may be explained that after about two years operating, electric apparatus and machinery, the repairs upon apparatus commences. I was advised that Mr. Dow, the first superintendent of the Detroit city plant, lost his position for having estimated that in 10 years the cost per lamp in Detroit would be not far from $120.

In the original construction arc lamps were erected upon towers in clusters of four and six lamps each. These towers have not been as satisfactory as was anticipated, and they are being pushed out into the suburbs, where they seem to be partially satisfactory for illuminating purposes in large spaces; and it is questionable if they would not be abandoned altogether but for the fact that the city has so much money invested in towers that abandoning them would be a confession of error or ignorance in first having erected them. As fast as towers are removed from the business portion of the city lamps are suspended in the center of the street, one lamp at each intersection being placed. It is unnecessary to say that Detroit is much better lighted than St. Louis, Mo.

Gas—There is no gas in use for street lighting, although, in my judgment, a number of gas lamps could be employed between towers to light the streets and sidewalks more satisfactorily than is the case now where dependence is placed upon tower lighting, although, of course, the expense to the city would be increased.

Buffalo, N. Y.—This was the next city visited. The light furnished is by private company. I was very soon impressed that the lighting service of the city of Buffalo was first-class in every particular. Number of arc lamps in use was 2,000. The former cost to the city was $117 for all-night and every-night service. The present cost, lamps having been increased to 2,300, is $109. When the number reaches 2,500 the price will be $100.

In the business part of the city the lamps are erected on iron poles about 35 feet high; four lamps at each intersection and at each alley intersection there are two lamps.

Gas—Outside the business and thickly settled portion of the city gas is used, there being 6,317 gas lamps. Cost to the city is $14.26 each per year. The city pays the gas company for the lighting and extinguishing of lamps in addition to the above, which would make an additional expense of about $2.04 for each lamp, or $16.30 per lamp per year. And if, again, to this amount were added the cost of repairs, $1.50, the total cost would reach $17.80. Gas lamps are used very generously in the parks and resident streets. The lighting service of this city is by far the best of any city we visited, in fact it is the best lighted city I have ever seen.

The total cost of lighting by electricity as obtained from the light superintendent is $255,880.10. Total cost of gas for gas lamps, $90,084.53. Cost of lighting, extinguishing and cleaning, $11,033.77.

Chicago, Ill.—This was the last city visited, but no special information was obtained. I am informed the contract made by the city with electric lighting companies for arc lamps is $145 each for all night and every night service, while the cost to the city of producing its own light is $167.78 for all night and every night service.

No special information was obtained in regard to gas lamps, except that there are many thousands of them in use, and it is understood the price depends upon the quantity of gas consumed; the city performing the lighting, extinguishing and cleaning.

Des Moines, Iowa—Number of electric arc lamps in use, 181 for all night and every night. Old price, $126; new price, $75. One hundred and twenty-five lamps on moonlight schedule, old price, $96; new price, $65. Gas lamps, 621 at $17 each (company lighting, cleaning, extinguishing and repairing). Gasoline lamps, 831. New price, $9.63 (company cleaning and repairing).

Comparing our own city with the cities visited, I am satisfied that the service rendered is superior to that of any city except Buffalo, N. Y., where special effort is made for a complete and thorough lighting of its streets at night and where money seems to be plenty and spent freely for this purpose.

Considering the price paid in Des Moines and the service rendered, we should, it seems to me, congratulate ourselves that the results obtained compare very favorably with other cities.

Massachusetts Charitable Mechanics Association.

The twentieth triennial exhibition of this association will be held in Mechanics' Building, Huntington avenue, Boston, during October and November of this year. The exhibition is under the management of an executive committee composed of Mr. Horace H. Watson, chairman; Mr. Samuel N. Davenport, treasurer, and Mr. Henry D. Dupee, secretary, to whom all communications should be addressed. No charge is made for space occupied by mechanical exhibits, and special preference will be shown to those who desire to show working exhibits.

A Duncan Meter Catalogue.

The Fort Wayne Electric Corporation, of Fort Wayne, Ind., has issued a handsomely illustrated catalogue describing in detail the Duncan integrating meters for alternating currents. These meters are simple, compact and accurate and are supplied to measure ampere hours, lamp hours and watt hours. The catalogue, which is sent free on application, also contains a number of tables valuable to central station men.

NEWS FROM THE WEST.

The American Storage Battery Company, Chicago, is now nicely settled in its new quarters at 174 South Canal street, and hereafter orders will be filled with the usual promptness.

The St. Louis Electrical Supply Company is devoting more care than ever to its telephone department, in which it has gained such an enviable reputation. The Ruebel transmitter is a marvel of simplicity, and one of the most sensitive instruments on the market, without being liable to pack or get out of order in any manner.

Columbia Incandescent Lamp Company, St. Louis, reports a gratifying increase in its export business during the last month or so. Evidently the good qualities of the Columbia lamp are fast becoming known abroad. President Rhotehamel, of this company, has not been feeling very well of late and has left for a recreation trip to Hot Springs.

The Stromberg-Carlsen Telephone Manufacturing Company, Chicago, some time ago equipped the Pittsburgh station of the Pennsylvania Railway with a complete intercommunicating telephone system. The officials were so well pleased with the working of the plant, that orders for Chicago, Columbus and Ft. Wayne were given without solicitation. This would seem to speak well for the quality of the company's apparatus.

The Central Telephone Manufacturing Company, of St. Louis, although in business but a short time, is already crowded with orders, and will, no doubt, get its share of the business. The company recently bought the equipment of the Missouri Telephone Manufacturing Company, and with several improvements added to the apparatus promises to produce exchange and private line equipments equal to any.

At the recent Northwestern Electrical Association Convention at Milwaukee, Parlor 8 was occupied jointly by Meysenburg & Badt and the Cloos Electrical Engineering Company. Professor Badt and R. F. Schuchardt, of Chicago, assisted by Mr. William Goltz, of Milwaukee, had charge of the firm's exhibit, which comprised a complete line of all specialties handled by the company. Attractive circulars and pamphlets told of the Weston Electric Instrument Company's portable and switchboard instruments, of K. & W. specialties, of Electra carbons, of Carpenter enamel rheostats, regulators and speed controllers, of the Edison plastic rail bond, and last, but not least, of Helios enclosed arc lamps, both direct and alternating, of which several samples were shown in operation, eliciting nothing but the most favorable comment from all who called. C. E. K.

ELECTRIC LIGHTING FOR PROFIT.*

BY ALEX DOW.

This subject is one which every member of this association has studied and concerning which every member must have opinions. I have selected it for the paper which your secretary asked me to present at this meeting because I have opinions of my own which I think may be of interest to other electric light men and which I want to hear discussed and criticised and contradicted by you who are qualified by experience to do so.

I submit as the first proposition that we are all in business to make a profit. I don't expect to be contradicted on that proposition, although some may wish to so amend it as to indicate that they are at present content if they can avoid a loss. As a second proposition I submit that the conditions of the electric light industry have so changed in the last few years that the opportunities of profit are limited; that the margin between earnings and expenses tends to vanish and can only be kept in view by unceasing endeavors to increase the one and reduce the other. The days have departed when a neat dividend could be paid on a small business done at high prices; and now, if a dividend is to be paid at all it must be earned by doing all the business that can be obtained and at prices set but little above the actual cost of production As the preceding statement forms the text of this discourse, I ask your attention to its repetition, as follows: I believe that the proper policy of electric light management under the conditions of the present time, is to sell electric energy to every accessible user, in any shape that the user requires, and at the lowest price which will pay a reasonable profit on the capital invested.

Those of you who were in the business at its beginning will recognize in this profession of faith the converse of the rule which then governed us. We used to believe in a "system," and the people who taught us to so believe, charged us so much for the experience and the incidental machinery which we acquired, that we in turn had to collect great prices for the product sold to our customers. The rule was to get out of the business all that it would stand, and if a possible customer did not like the particular kind of energy which our "system" furnished and thought he would like the kind which some other alleged system was supposed to produce, we considered him a heretic. Electric light was then a novelty and a luxury and a mystery, and was to be respected and paid for accordingly. Nowadays it is a thing of domestic use; the machinery for its production is sold as freely as any other machinery; the principles governing its distribution are taught to all who desire to learn, and its supply is recognized as a customary or even necessary public service exactly as is the supply of gas and water. It is proper that we should announce a policy suited to the new condition. That many have done so, I know; and also that some have long been governed by just such a policy as I advocate; but there still remain, to the detriment of the business at large, some who are trying to run their affairs on the old plan. They do not profess to do so, and if challenged they may plead the old excuse that the cost of their plant and the losses incident to its first operation have been so great as to require high prices for the energy sold. That excuse is not valid in these latter days. Taxing customers all they will stand means competition either by an opposition plant or by the municipality, and either of these means ruin to the station which is run on the old lines.

Of course, I do not intimate that any member of this association is managing his business to-day after the fashion of the eighties. But each of us knows of some plant in the next town to ours which is run just that way. That plant is going to fight it out on the old line until it is wiped out by a municipal plant, and the municipal plant will publish a report to the whole United States that it has reduced the price of lighting 30 or 40 per cent. Then you and I and each of us is going to have the trouble of explaining at great length to our own particular municipal authorities why a municipal plant established in our town can not possibly make any similar reduction.

Gentlemen, the man who used to sell experience to us is probably to-day trying to show the ambitious city fathers of that other town next to ours how well they can serve their constituents, and how much honor they can obtain from society at large, by engaging their municipality in the electric lighting business. Our friend with experience to sell is not one bit more exact in his statements than he used to be long ago, and we can not honestly say that his operations are beneficial to our business; but he is less detrimental than the man who gives him a chance to get in his work, the man who ought to be giving good service to a satisfied constituency, but who is furnishing lights that are a disgrace to the "system" and its owner, and trying to collect higher rates than those at which you and I are giving first-class service to our public.

This is a much discussed question. The man in the next town believes that a reasonable profit is everything he can get; and at the other extremity of belief is the man who holds that no public service should pay a profit to any individual. Between these limits will be found the opinions of the great majority of Americans whose democratic training has taught them that the commonwealth should not undertake any work which can be satisfactorily performed by private enterprise. Those members of this great majority who have money invested in manufacturing or in commerce recognize that a reasonable profit means something more than can be obtained by the investment of their funds in government bonds or by placing them in a savings bank, and yet something less than is hoped for when the investment is of a speculative character, involving risk of total loss of capital, such as the exploiting of a new mine or the insurance of an overdue vessel and its cargo.

I believe that, after operating expenses are paid and any deterioration of the investment shown by a carefully made inventory has been made good, a dividend such as is paid by a good manufacturing business is reasonable for electric lighting. Such a dividend will necessarily vary with the line of manufacture; those concerns who manufacture a staple having a practically constant market being satisfied with a narrower margin of profit than those others where the production has to be varied from time to time and new markets developed at intervals. The same considerations govern in the electric lighting business.

A station which is well established; has no ruinous competition to meet; is not threatened by municipal interference, and is not obliged to continually risk money in extensions of an uncertain character, may well pay a dividend but little in excess of the current rate of interest in savings banks. The station in which all these conditions are reversed, particularly when there is a prospect of its investment being wiped out by causes which its management can not control, is entitled to a greater return.

There is much work to be done in the education of the public to a proper understanding of the economical principles underlying this subject. The citizen who has theories about municipal service does not apply these to his own affairs; nor will he apply to his theories the rules which govern his personal practice until you show him that this should be done. He thinks it no harm that he should draw from the capital invested in his own business 10 or 15 or 20 per cent in addition to a fair salary for management and any loss that is shown by annual inventory. He thinks it entirely proper that he should build up a business worth much more than its nominal capital by returning into it a large annual surplus. But he will denounce as extortionate an electric lighting company which pays a good deal less than 10 per cent, and for such a company to show a surplus is in his eyes *prima facie* evidence of robbery of the public. He, on the one hand, refuses to protect the public service corporation from unlimited competition, and, on the other hand, demands that it do business for a rate of profit accepted only on the safest class of investment bonds.

In Europe they are more logical. They limit the price which a company may charge to its customers and the dividend which it may pay to its stockholders. They require the company to give good service to all who demand it within certain area. But at the same time they permit no competitor to enter the same district, and they provide for the purchase of the property at a reasonable price in the event of the franchise not being renewed at its term. Where they restrict they also protect. Our theorists have yet to learn that these two actions should go together, and it seems to be our affair to teach them this lesson.

There has been of late much discussion of this subject at conventions and in the electrical press, and with good reason. American practice has heretofore been to make rates without sufficient analysis of cost; and particularly without attempting to make each unit of energy sold bear its proper share of the standing charges of the plant. Premising that we are to readjust rates for a minimum profit, we must do so according to a carefully considered system. It will not do to make a horizontal cut on the present schedules, because analysis will show that some business now done at the highest rate is not profitable, and a reduction of rate should only be made on business that is profitable.

It has been said that American customers insist on a uniform rate—a "one-price American plan" method of charging. I do not find it so. I have no difficulty in explaining to those customers whom I meet why some business should pay a higher rate than other business; and other electric light men tell me that, after they have got the principles involved clearly defined in their own minds, their experience with customers is similar to mine.

The base of any system of rate-making must be analysis of the costs of production. The method of analysis which I have found most useful is that proposed by Mr. Arthur Wright. The paper read by that gentleman at the last meeting of the National Association is doubtless familiar to you, but as American conditions usually differ from those existing at Brighton, it is seldom possible to apply the short method of estimating standing and running costs which Mr. Wright found convenient, and an analysis in detail must be made. I use the following method: Consider what the condition of the station would be if you were obliged to be ready to do the same business that you now do and during the same time, but had no customers taking current. You would have fires lighted, men on duty, dynamos turn-

* Read Before Northwestern Electrical Association, Milwaukee, January 19, 1898.

ing over, lines strung and connections made to customers' premises. You would burn enough coal to keep up steam and keep the dynamos in motion, and you would have enough help for these conditions. But you would not burn so much coal as if the machinery were running at full load, and you might need less help. Your lines would be out in the weather or buried in the ground; and that deterioration which is due to time and to climate would go on just the same, and would have to be made good by a repair gang. But you would not need renewals of incandescent lamps or carbons, and you would not keep any men to put in fuses for customers or to read meters. You would need a manager and an engineer and an electrician, just as you do now, but you would not need a bill clerk nor a collector, and you might do without an office boy. My rule is to ask whether the item of expense under consideration would continue or would cease under the conditions described. If it would continue it is a standing charge. If it would cease it is a running charge. It is clear that taxes, insurance and interest are standing charges.

Mr. Wright has shown us that it costs us a great deal of money to get ready to serve a customer, even though the customer only requires service for a single hour in a year. This amount he calls the standing charge. He has pointed out that a uniform rate takes no account of this, but is apparently based on the assumption that it costs just the same to furnish current to a customer for one hour in the year as for each hour of 1,000 hours in a year. He argues correctly that in making rates we should take account of a customer's load factor and he goes on to describe an ingenious method and an ingenious device invented by himself for taking such account. Whether we adopt his device or not we must all admit the correctness of his statement of the conditions governing costs of production and we must, if we are hereafter to do business at a profit, make our rates with a due regard to these conditions

To discuss in detail the whole theory and practice of rate making is beyond the scope of this paper. I advise each of you who has not already done so to make analysis of your costs in such manner as to distinguish between standing and running expenses. Using Mr. Wright's paper as a text-book, you will find, as I say, that the labor is paid for by the results obtained. Properly tabulated, these results will show what business is profitable at any given rate or what rate should be made on any given business. My analysis showed me that I could afford to sell current to a large class of users at 4½ cents per unit, while a rate already established at $14\frac{4}{10}$ cents for another large class was not profitable. Now I am taking all the 4½ cent business I can find and am letting other people hunt for the $14\frac{4}{10}$ cent kind.

(To be continued.)

THE PRACTICE OF THEORY.*

BY J. C. M'MYNN.

The subject of this short paper reminds me of a trolley car, for the reason that it can be turned either way and runs equally well. Whether the subject should be the "Practice of Theory" or the "Theory of Practice," I must leave for your judgment.

In the development of electrical machinery together with the necessary steam auxiliaries, Theory and Practice have been the complements of each other, and neither could have reached the present stage of perfection without the assistance of the other.

Theory is much more progressive, and as a usual thing precedes Practice, for Practice paves the way, and lays the track for, and makes it possible for the practical man to become a factor in the engineering profession.

The object of this paper is neither to practice nor decry Theory or Practice, but to simply recall to your minds the close relations existing between the theoretical man and the practical engineer; to a certain extent we are all theorists, for we have our own original ideas and fancies, and oftentimes the engineer who prides himself on his being a practical man is the most theoretical.

However, it is with regret that I notice that the old-fashioned engine driver is fast disappearing. How he could sneer at and deride "book learning" and "book foolishness," but he deserves our respect and admiration for the success he attained, and the good work which he expended happily but unnecessarily. He knew nothing of the Board of Trade units in his coal, nor of entrained moisture in his steam, nor of the hyperbolic curve in his engine, but he managed to keep his engine and plant going, and to still have time to ridicule "book learning."

We have also met the theoretical engineer or college boy who could calculate the thermal efficiency of an entire plant from the coal pile to the incandescent lamp, but who could not start a Corliss engine, and who would be worthless in an emergency.

Neither of those men fill our ideal, but a proper combination between the two will give us an able, earnest, thoughtful and cautious engineer. Engineering colleges are to-day turning out, year after year, educated engineers who are exerting a strong influence on the profession, which is resulting in a strong union of practice and theory, the outcome of which must necessarily be engineers of a high standard, with broader and deeper foundations of learning and experience.

In my idea the application of theory to practical work is of the utmost importance to every owner of steam and electrical machinery. In construction work as well as in operation it is most valuable. To be sure, an engineer can consult a text or handbook, and can there find out that masonry will sustain certain loads, or that a girder of given dimensions will support a certain weight, but if he is unable to understand "the how" and "the why," he is much more liable to make an error. One may read that phosphorous is detrimental to boiler and other steel, but if the reason is not clear, can one appreciate the danger arising from its presence?

To a certain extent the manufacturer represents the practical side of engineering, while the inventor and consulting engineer represent the theoretical side, yet frequently the manufacturer sees the advantage of practicing theory, and in such cases we see experimental laboratories established in large plants, and original research carried on under the supervision of the most competent theorists.

I firmly believe, after mature observation, that the educated engineer who can master Practice as well as Theory is the one who will rise above his competitors in the future. Yet, do not understand that by "educated" I mean necessarily a college graduate. A man who can master the laws of mechanics and can conquer mathematics by his own exertions is deserving of more credit than one who was sent to college and learned simply because it was pounded into him.

Nearly every modern machine is an example of practical application of mechanics and design to theoretical ideas and discoveries, which thus become mechanical laws. Men knew that the electric current would some day become of commercial value, and long before the perfected dynamo appeared, the laws governing the generation of the current were known.

A recent invention is a good example: For years we have known that a boiler feed-pump was doing much more work than was necessary, for if water were pumped into a closed tank at an elevation above the water-level, and then this tank were opened into the boiler, the water would run into the boiler by gravity; the pump would be pumping against a 20-foot head instead of, perhaps, a 200-foot head. The recent invention consists of forcing the water to a level above the boiler, and then shutting valves and utilizing gravity. The saving made is about 85 per cent of the steam formerly used by the pump. I simply mention this as a good example of the practice of Theory.

In a certain way Theory is the foundation and Practice the structure of an engineer's attainments. The deeper and more substantial the foundation, the higher and more imposing can be the superstructure; the more substantial the foundation, the more resistance will the structure have to either the winds of adversity, or the more dangerous gusts of flattery and adulation.

* Read before the Northwestern Electrical Association, Milwaukee, January 20, 1898.

The Chicago Department of Electricity.

The latest thing in municipal affairs in Chicago is a brand new Department of Electricity, just created by the City Council. The city electrician was formally under orders of the fire department, but under the new ordinance he will be head of a separate department, which will include an assistant electrician, superintendent of construction, chief clerk, bookkeeper, chief inspector and nine assistant inspectors.

The ordinance provides for the following salaries: City Electrician, $4,000; Assistant City Electrician, $3,250; Superintendent of Construction, $2,000 per annum.

Under the terms of the ordinance, persons desiring to install wires for electrical use must secure a permit from the City Electrician. Among the duties of the City Electrician is that of inspecting new electrical appliances being installed under permit of the department. All electrical appliances pronounced unsafe to life or property by the chief of the department must, under the terms of the ordinance, be made safe within 48 hours after due notice to the owner from the department, under penalty of a $10 a day fine.

The following fees are to be collected by the department: One dollar for each light, not less than $1 for each inspection, $1 for each electrical horse-power used for other than lighting purposes, 10 cents for each 16-candle incandescent lamp, and for larger or smaller lamps in proportion; for inspection of show-window exhibitions and other temporary installations, a charge of 50 cents an hour. For each reinspection, one-half rate may be charged.

ADVANCE INFORMATION

Electric Light and Power.

BRITTON, S. D.—The electric light plant is about completed.

DALTON, GA.—The Mayor may be addressed for information concerning erection of electric light plant.

WHITE CASTLE, LA.—Col. James A. Ware is interested in the establishment of an electric light plant.

SCHOOLCRAFT, MICH.—City Clerk may be addressed concerning establishment of electric light plant.

INDIANAPOLIS, IND.—The Jenney Electric Comp any will rebuild plant which was recently burned.

COUNCIL BLUFFS, IOWA—The Carson Electric Light Company has been incorporated by William Holtze, David A. Snapp and James S. Campbell, and they will soon commence the erection of a plant at Carson.

KANSAS CITY, KAS. — A large electric power-house will probably be erected for the manufacture of electricity.

CHESTERTOWN, MD.—W. J. Hoffman and J. K. Wright have been granted franchise to light the town, and will erect a $15,000 electric plant.

SPRING GREEN, WIS.—G. S. Post may be addressed concerning construction of electric light plant.

MCCOMB, MISS.—The Mayor may be addressed concerning establishment of electric light plant, for which Sanders & Porter, of Louisville, Ky., will prepare plans.

WASHINGTON, D. C.—The Standard Cold Electric Light Company has been incorporated, with John Boyd as president, to manufacture electric lights for surgical use; capital stock, $100,000.

DICKSON, TENN.—Captain John Adams may be addressed concerning establishment of an electric lighting plant.

HAGERSTOWN, MD.—The Washington County Electric Power Company are preparing articles of incorporation, for the purpose of establishing an electric plant in this city, to compete with the plant owned by Powell Evans, who is negotiating with Williamsport, Pa., capitalists for the sale of his plant. Evans has the contract to light Hagerstown until 1901.

WINNSBORO, TEX.—W. G. Ragley Lumber Company may give information concerning establishment of electric light plant.

PHILADELPHIA, PA.—The Philadelphia Electric Light, Heat and Power Company has been incorporated by G. R. Green, J. R. Embery, H. R. Barramore, J. J. McCarthy and Henry Watts; capital stock, $1,000.

ROCK RAPIDS, IOWA—An electric lighting system has just been completed.

SARATOGA, N. Y.—The Consolidated Electric Company, with a capital stock of $10,000, has been incorporated. The directors are E. L. Ashley, E. J. West and Mrs. Elizabeth H. Ashley. The purpose is to furnish electricity for lighting and power in Fort Ann.

CASPER, WYO. — H. Magee, of Rawlins, will put in an electric plant in this place. The plant will have 750 lights, 15 of which will be arc. The plant will be in operation in five months.

TORONTO, CAN.—Cardinal Electric Light Company has been incorporated; capital stock, $20,000.

EASTON, OHIO—Eckhard Brothers, of this place, have been granted a franchise to put in electric lights at Canal Fulton for $800 per year. They have also agreed to furnish incandescent lights for 50 cents per month for each light.

MARQUETTE, MICH.—The Norway Electric Company has been given a franchise to light this place with electricity.

New Incorporations.

WASHINGTON, D. C.—The Electrical Railway Equipment Company has been incorporated, with Archibald Greenless, of Washington, as president, for the manufacture and equipment of electric railways; capital stock, $100,000.

CHICAGO, ILL.—The Calkas Light Manufacturing Company has been incorporated by Edward J. Ryan, Henry C. Marston, Thomas D. Shannon to manufacture lamps and lighting appliances; capital stock, $100,000.

CHICAGO, ILL. — The Fischer Equipment Company has been incorporated by Andrew J. Hirschi, William A. Rogan, Edgar R. Hart to supply electrical equipment; capital stock, $2,400.

BALTIMORE CITY, VA.—The Virginia Electric Company has been incorporated, with A. D. Bodson, secretary and treasurer; capital stock, $1,000,000.

ROCHESTER, N. Y.—The Rochester Electrical Manufacturing Company has been incorporated, with a capital stock of $50,000.

UTICA, N. Y.—The Utica Electrical Manufacturing and Supply Company has been incorporated; capital stock, $15,000.

ROCHESTER, N. Y.—The Standard Electric Signal Company has been incorporated; capital stock, $200,000.

CHICAGO, ILL. — Oakman Motor Vehicle Company has been incorporated; capital stock, $200,000; incorporators, Max E. Hertel, George J. G. Brandenburg and Day McBirney.

LEWISTOWN, MONT. — The Citizens' Electric Company has been incorporated by D. M. Crowley and others; capital stock, $10,000.

BROOKLYN, N. Y. — Hart-Ayres Manufacturing Company has been incorporated, to manufacture motors, etc.; capital, $15,000; directors, Chas. Hart and T. G. O'Connor, of Brooklyn, and Paul Ayres, of Oceanside, Queens County.

NEW YORK, N. Y.—The Lurye-Lewis Electric Protective Company, with a capital stock of $5,000, has been incorporated; directors, H. J. Lurye, M. H. Lewis, Simon Schwarz and Joseph Schwarz, New York city.

New Electric Railways.

BAY CITY, MICH.—The Bay, Tuscola & Huron Electric Railway Company has been formed to construct an electric road from this city to Sebewaing.

JOHNSTOWN, PA.—The Lykens & Williams Valley Street Railway Company has been incorporated, with John B. Skyles, president, to construct and operate an electric line between this place, Schuyler County, and Lykens, Dauphin County, a distance of 10 miles.

NEW ROCHELLE, N. Y. — The Hugenot Electric Street Railway Company has been formed by Louis K. Fries and Jacob M. Schuyler, to construct an electric line 11 miles in length.

LEXINGTON, VA.—A bill has been introduced in the legislature at Richmond applying for a charter for the building of an electric street railway in this city. J. R. Williams and Augustine Royall, of Richmond, are interested.

SPRINGFIELD, ILL.—The Chicago & Desplaines Valley Electric Railway Company has been incorporated by Henry G. Foreman, Clayton E. Crafts, Charles D. Evans, Philip H. Gray and William M. Hulbert, to construct and operate an electric railway from a point in the town of Wheeling to some point in the town of Lemont; capital stock, $1,000,000.

NEW YORK, N. Y. — Steps are being taken to build an electric railroad from Philadelphia to Jersey City.

TOLEDO, OHIO—The Toledo & Ottawa Beach Railway Company has been incorporated with $100,000 capital stock. James King Duffy, Cerlan M. Spitzer, A. L. Spitzer, John H. Dole and Charles T. Lewis, incorporators.

SANDUSKY, OHIO—The Sandusky, Norwalk & Toledo Electric Railway Company has just been incorporated with an authorized capital of $1,000,000.

MAYSVILLE, KY.—The owners of the Maysville & Mount Sterling turnpike are talking of building an electric line from this place to Flemingsburg.

WILMINGTON, DEL.—The Wilmington City Railway Company will build a branch line to Hazell Dell Park.

New Telephone and Telegraph Companies.

MISSOULA, MONT. — The Rocky Mountain Bell Telephone Company manager has been ordered to extend line to Wallace, Idaho.

MARION, N. C.—J. W. Kirby and B. B. Price will put in a telephone system for Marion.

SEYMOUR, TEX.—The Haskell & Throckmorton Telegraph and Telephone Company has been incorporated by T. H. C. Peery, G. P. Barber and G. C. Plants, to construct, operate and maintain a public telegraph and telephone line and system between the towns of Seymour and Haskell; capital stock, $3,000.

WALLACE, IDA.—The Montana telephone lines are to be extended to this city, which will give a through line to Oregon and California.

GREENVILLE, MICH. — Greenville Telephone Exchange has been incorporated, with a capital stock of $15,000.

CHARLOTTE, N. C.—J. A. Helvin has secured franchise for construction of telephone system.

LUSK, WYO.—A telephone line has been constructed between this city and Manville.

LITCHFIELD, MINN.—A company has been formed to put in a local telephone system to be extended over the county.

Kindred.... ...Interests

McKenney & Waterbury, 181 Franklin street, Boston, the well known manufacturers of gas and electric fixtures, have recently secured some very large contracts which call for considerable quantities of the handsome glassware manufactured by the Phœnix Glass Company, 42 Murray street, New York city.

Messrs. Sipe & Sigler, manufacturers of the Willard storage battery, have recently filled orders for the Western Union Telegraph Company for 120 Willard storage cells for Hoboken, N. J., 40 cells for Scranton, Pa., 30 cells for New Haven, Ct., 25 cells for Newark, N. J., and 343 plates for Ravenna, N. Y.

The Clyde Line has issued a very handsome booklet, entitled "To Florida and the Sunny South," giving full information of the enjoyable pleasure and health resorts available by this route. To any one contemplating a southern trip, this booklet will be of great value. The Clyde Line carries its passengers directly from New York to tropical latitudes without a single change.

The Merchants' Association, of New York, is sending circulars to merchants throughout the United States drawing attention to New York as the great trade center of the country. The circularizing done last year by this progressive association was so effective that it is proposed to keep it up during 1898, even on a broader and more liberal scale. The association is entitled to great credit for what it has done in bringing trade to New York.

FOR SALE—A well equipped plant for the manufacture of cement-lined ducts for electric light and telephone companies, situated on the line of the N. Y., N. H. & H. R. R., and convenient to tide water. Said plant has facilities for making two miles of pipe per day and is in complete running order. Talcott H. Russell, Receiver of The Connecticut Pipe Manufacturing Company.

Among the extensive improvements now being made by the Benjamin Atha & Illingworth Company, at Harrison, N. J., is a new steel building known as the tower building. This building is 30 feet square and about 40 feet high. Thirty-five feet above the ground is a circular trolley track carried by the roof trusses. The framework of the building is of steel throughout, and the siding and roofing of corrugated iron. The complete contract for furnishing and erecting this building has been given to the Berlin Iron Bridge Company, of East Berlin, Ct.

The Electric Storage Battery Company, of Philadelphia, has just prepared a new catalogue describing the various types and sizes of the well known Chloride accumulator. There are a very large number of applications of the storage battery to various kinds of electrical work illustrated and described in this catalogue, and the pamphlet is well worthy the attention of all interested in the generation and distribution of electric current. There is also a list of installations made by the Electric Storage Battery Company in lighting stations, for regulation in street railway plants, isolated plants, in office buildings, private residences, government service, yacht lighting, and for miscellaneous uses.

The Sprague Electric Company, of New York, have secured the contract for motors, to be installed in the new works of the John Stephenson Company, Limited, Elizabethport, N. J. This is a large and important contract and some 48 motors will be utilized, ranging from three horse-power to 40 horse-power, mostly large size machines. The motors will be of the well known Lundell type, and will be direct-connected, belted or coupled to the latest types of wood-working machinery. As is generally known, the Lundell motors are of the inclosed type, and are admirably adapted for use in wood-working machinery establishments where, of necessity, the atmosphere is filled with dust. Several large-size Lundell, direct-connected, exhaust fan outfits will also be included in the equipment. The plant will be one of the largest of its kind in this country, and will be equipped exclusively with the Lundell motors.

WANTED—A Business Man, who is also a Mechanical and Electrical Engineer, will be open to a position after February 1, as Manager of an Electric Lighting Plant or a Railway in any city of 30,000 or more. In present position has increased business ninety per cent in past year.

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Telephone Users (INTENDING)

are reminded that the next quarterly issue of the TELEPHONE DIRECTORY will go to press on March 1st. To obtain the advantage of listing in this issue of the directory it will be necessary to make contracts during the present month.

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[Specially reported for this journal by E. S Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED FEBRUARY 1, 1898.

598,092 Alternating current-motor; A. Heyland, Frankfort-on-the-Main, Germany.

598,097 Electric control device for elevators; J. D. Ihlder, Yonkers, N. Y.—The combination with an elevator-operating mechanism and a control device therefor, of a control-motor and an electro magnetic clutch, the clutch being provided with teeth.

598,099 Station indicator; D. C. Jones, St. John, Ky.

598,109 Insulating attachment for electric connectors; R. P. Osgood, Methuen, Mass.

598,160 Electric fire alarm circuit and signal-box; L. G. Rowand, Camden, N. J.

598,172 Telephone system; C. A. Barron, Tacoma, Wash.—In a telephone system, a combination with a party line and a series of telephones thereon, of a switch for each telephone, an electro-magnetic locking device for each switch, and included in a normally closed local circuit and means whereby to maintain the circuit of said locking device, open-circuited when the lever is in use, whereby to prevent all the said switches, except the one belonging to the telephone in use, from being closed.

598,180 Apparatus for electrolytically producing zinc; C. Hoepfner, Giessen, Germany.

598,183 Telephone system; R. T. Reid, Tacoma, Wash.

598,184 Conductor for electric railways; G Ritter, Stuttgart, Germany—In a three-wire electric railway system, the combination with a series of pairs of contact devices, capable of vertical movement, said contact devices being beveled on their lateral faces in opposite directions of a car, and a shoe carried by the car and provided with a beveled end, whereby the contact devices will be alternately raised or depressed.

598,198 Electric lamp for bicycles; P. A. Dowd, Boston, Mass.

598,199 Mechanism for starting, stopping and controlling speed of motors of electric cars; F. H. Foster, Brooklyn, N. Y.

598,208 598,209 Electric meter; C. D. Raab, Kaiserslautern, Germany—A motor wattmeter for alternating currents having a rotary armature without current supply and a coreless solenoid, in combination with two coreless shunt field coils of like polarity, so arranged as to form a common magnetic field.

598,260 Electrical conductor; L. C. Werner, Broad Brook, Ct.—The combination, with a line of way, of an electrical conductor extending along such line and having a bent portion out of alinement with the body of the conductor; a conductor clamp for engaging said bent portion and supporting the conductor; a conducting bridge piece spanning such bend and in alinement with the body of the conductor.

598,269 Polarized signal bell; F. R. McBerty, Downer's Grove, Ill.—The combination, with a polarized magnet and a centrally pivoted armature therefor, of a tube of copper surrounding the armature, and a helix surrounding the tube of copper, the said helix being connected with the circuit of the magnet, and being adapted to neutralize the magnetic force thereof on the armature.

598,272 598,273 Instrument-winding device; A. J. Oehring, Chicago, Ill.—In an armature winding machine, the combination of means for winding coils of wire upon the armature core, with automatic means for discontinuing the winding of each coil when a predetermined number of turns have been received thereby.

598,285 Telephone apparatus; F. B Cook, Chicago, Ill.—An annunciator drop consisting of a front plate carrying the hinged drop of the annunciator and a slotted insulator block also secured to said front plate within which the contacts are disposed.

598,303 Electric heater; E. E. Cruzen, Baltimore, Md.

598,316 Electric gas-lighting apparatus; C. Eichman, Indianapolis, Ind.

598,318 Electric furnace; J. E. Hewes, Philadelphia, Pa.—In an electric furnace the combination of a chamber into which the material is fed, a reciprocating rammer for expelling the material from said chamber, pencil holders pivotally supported on each side of the outlet of the said chamber and circuit connections for said pencils.

598,328 Terminal head for electrical conductors; C. H. Sewell, Chicago, Ill.

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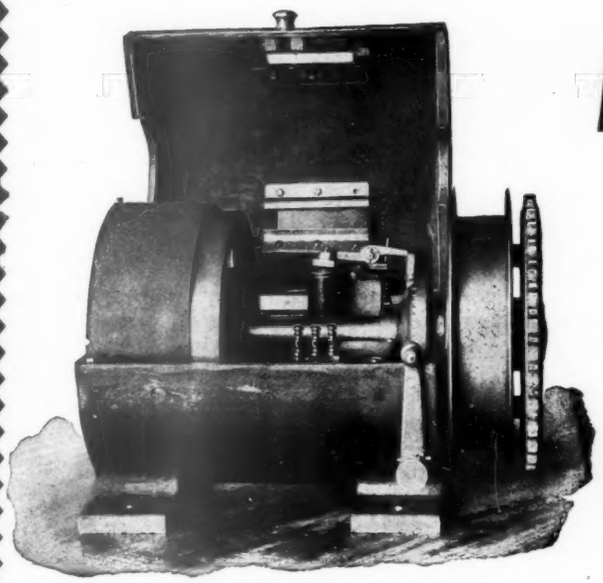

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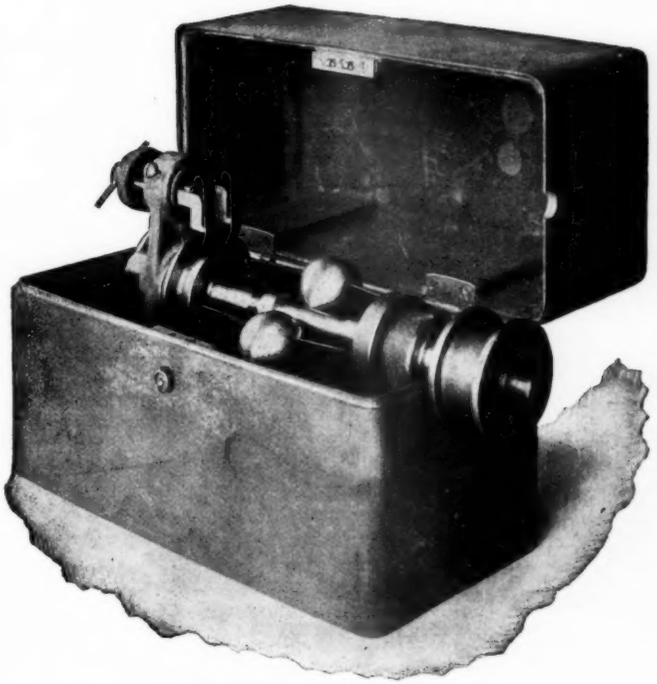

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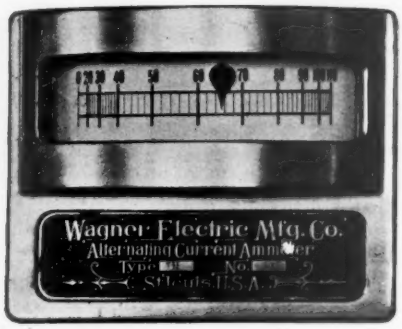

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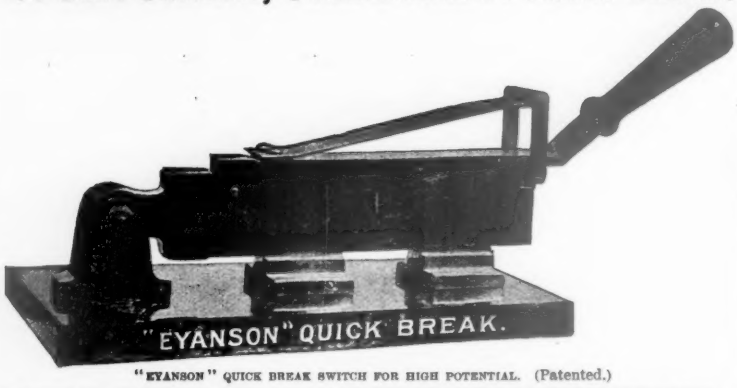

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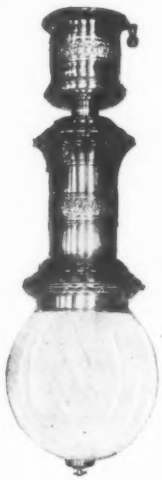

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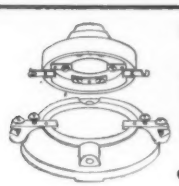

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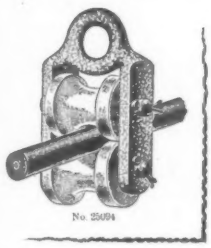
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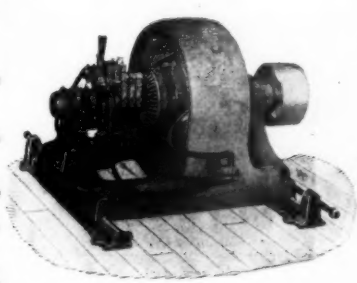

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INDEX OF ADVERTISERS.

A

	PAGE
Abendroth & Root Mfg. Co., boilers	xx
Akron Insulator and Marble Co.	xiii
American Electrical Works, insulated wire.	i
American Bell Telephone Co.	xvii
American Electric Telephone Co., long-distance telephones.	xvii
American Impulse-Wheel Co.	xiii
Andrews-Ryan Co., telephone engineers.	xvi
Armington & Sims Co., engines.	xv
Armorite Interior Conduit Co.	xviii
American Stoker Co.	x

B

Babcock & Wilcox Co.	xx
Brady, T. H.	113
Bristol Co.	i
Bunnell & Co., J. H., dry batteries.	i
Baker & Co., platinum.	vi
Ball & Wood Co., engines.	xv
Barron & Co., James S.	113
Berlin Iron Bridge Co.	xv
Bogart Co., A. L.	113
Brixey, W. R., Day's Kerite wires and cables	i, xiv
Buckeye Electric Co.	viii
Bibber-White Co.	viii

C

Cherry Electric Works.	113
Clyde L'ne.	ix
Columbia Incandescent Lamp Co.	i
Crefeld Electrical Works.	i
Crocker-Wheeler Electric Co.	i
Central Electric Co., electrical supplies.	iii
Chicago Edison Co.	vi
Cutter Electrical Co., circuit-breakers.	xiv
Central Mfg. Co.	vi
Crown Woven Wire Brush Co.	vi

D

Davis & Eagan Machine Tool Co.	xiii
Day's Kerite, insulated wire.	i, xiv
De Veau & Co.	
Diehl Manufacturing Co.	ix
Dixon, Jos., Crucible Co., belt dressing.	ix
Duval, E. S., Jr., patents.	113

E

Electric Appliance Company, supplies.	i
Eyanson & Armpriester.	viii
Eastern Electric Cable Co.	xvi
Electrical Exhibition Co.	
Empire China Works, porcelain specialties.	xviii
Eppinger & Russell Co., Valentine subway electrical conduit.	vi
Electric Storage Battery Co.	
Eddy Electric Manufacturing Co.	i
Edison Decorative & Miniature Lamp Department.	xiv

F

Fenton & Co.	
Fort Wayne Electric Corporation.	viii
Frink, I. P.	xx
Faraday Carbon Co., carbons	viii
Farr Telephone & Construction Supply Co.	xvii
Forest City Electric Works.	xviii

G

Goldmark & Wallace, "Koch" dynamo brushes.	i
General Electric Co.	xi
Gordon-Burnham Battery Co.	113
General Incandescent Arc Light Co.	

H

Hammacher, Schlemmer & Co., spring wires	ix
Hart & Hegeman, electric switches.	xiv
Heafford, Geo. H.	xiii

I

Imperial Porcelain Works.	xviii
India Rubber and Gutta Percha Insulating Co.	x
International Correspondence Schools.	113

J

Jandus Electric Co., arc lamps.	

K.

Keystone Electrical Instrument Co.	xiv

L.

Leffel & Co., Jas.	xx
Lombard Water-Wheel Governor Co.	xix
Lehigh Valley Creosoting Co., creosoted lumber	xvii
Locke, Fred M.	xviii
Lockwood Long-Distance Telephone & Telegraph Co. of America.	xix
Lynn Incandescent Lamp Co.	vi
Lyons & Bissing.	113

M.

McIntire Co., The C.	
McKenney & Waterbury	
Marshall, Wm., condensers.	xv
Mianus Electric Co.	xvii
Monarch Manufacturing Co.	vii
Montauk Multiphase Cable Co.	ix
Manchester Light and Power Co.	113
Massachusetts Charitable Mechanics Ass'n.	viii
Massachusetts Chemical Co.	i

N.

New York Insulated Wire Co., Grimshaw wires and cables.	i
National Carbon Co.	iii
National India Rubber Co.	i
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Novelty Electric Co., supplies.	xviii

O

Okonite Co., insulated wires and cables.	i, iv, v, xx
Ostrander, W. R., & Co., supplies.	113
Ohio Electric Specialty Mfg. Co.	xiii

P

Partrick, Carter & Wilkins.	114
Paiste, H. T., Co.	ix
Prentiss Clock Improvement Co.	113
Pennsylvania Electric Co., electrical supplies.	xvi
Phillips Insulated Wire Co., wire.	xiv
Phœnix Glass Co.	i

R

Roebling's Sons Co., John A.	xix
Rodrigues, M. R.	vi
Royce & Marean, electrical supplies.	xvii
Reisinger, Hugo.	

S

Stirling Co., water-tube boilers.	xx
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W

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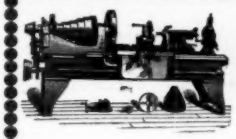

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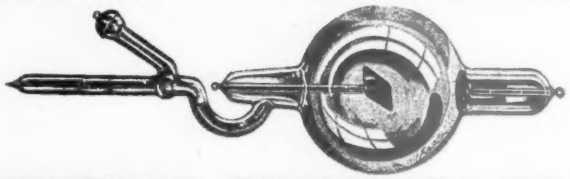

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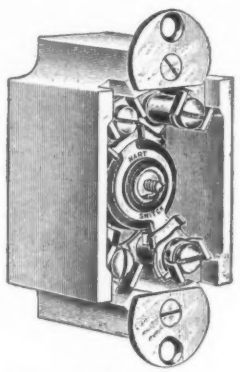

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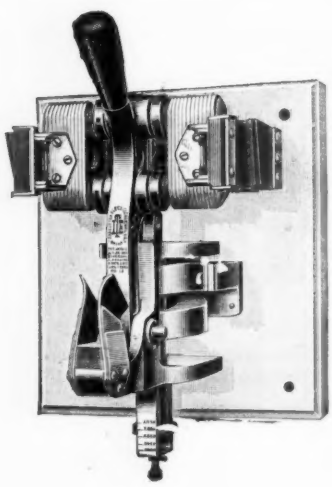

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